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Understanding Regional Differences in Work Hours

by Andrew Heisz and Sébastien LaRochelle-Côté

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Abstract

In recent years, differences in working hours between Canada and other countries have been the focus of a substantial body of research. Much less attention has been paid to regional differences in work hours, although differences in average annual work hours between some regions are of an order of magnitude that is similar to that of the Canada–U.S. difference. Using data from the 2004 Survey of Labour and Income Dynamics, this study examines how much of differences in working time between Ontario and five other regions of Canada can be explained by 'observable' differences, including differences in union status, industrial structure, job conditions and demographic characteristics. 'Observables' were relatively efficient in explaining differences in the shares of individuals working a short year and working a full-year, full-time schedule. However, they were not very helpful in explaining differences in long work hours, did not entirely explain the larger share of short-year workers in the Atlantic and in British Columbia, and did not explain the large incidence of the 'low' full-year, full-time schedule in Quebec (between 1,500 and 1,900 hours per year). These differences that remain unexplained suggest that 'unobservable' factors (those that are difficult to observe in household surveys) also contribute to regional differences in work hours. These include incentives related to wage inequality, possible tax incentives (or disincentives) built upon progressive taxation policies, differences in macroeconomic factors, in preferences and tastes, and in the shape of institutions.

Executive summary

In recent years, international differences in work hours have been the focus of a substantial body of research. Much less attention has been paid to regional differences in working time in Canada, in spite of regional differences in average work hours that are of a magnitude that is similar to that of the Canada–U.S. difference in work hours. In this paper, we document regional differences in work hours across 6 regions of Canada for 2004, using a representative sample of 19,500 workers from the Survey of Labour and Income Dynamics. We also examine potential explanations for these differences.

Average hours per worker were lower than the Canadian average in Quebec, the Atlantic and in British Columbia. In the Atlantic and in British Columbia, low working hours were mostly the result of a larger share of individuals working short years. In Quebec, the relative prevalence of the 'low' full-year, full-time schedule (the equivalent of 29 to 37 weekly hours of work over 52 weeks) was the main difference between this province and the rest of the country (including Ontario). This suggests that Quebec–Ontario differences in average work hours, for the most part, were the result of differences in the middle of the hours distribution.

Average hours were higher than the Canadian average in Ontario, Manitoba–Saskatchewan and in Alberta. While differences in average work hours were relatively small across these regions, men in Manitoba–Saskatchewan and Alberta were relatively more likely to work more than 2,300 hours per year (long year), and women were relatively more likely to work fewer than 1,500 hours (short year). Ontario had more individuals working between 1,500 and 2,300 hours per year (full-year, full-time schedule).

What explains regional differences in working hours? International studies of working time often point to a large pool of 'observable' factors (factors that can be easily quantified in household surveys) and 'unobservable' factors (factors that are difficult to observe in household surveys) to explain international differences in work hours, which may also apply to regional differences in work hours. Unobservable factors include differences in incentives related to wage inequality as well as differences in taxes, in macroeconomic conditions, in local preferences and tastes, and in the shape of institutions. Observable factors include compositional differences in union status, industrial structure, job conditions and demographic characteristics.

Using decomposition techniques, we determine how much of the differences in work hours between Ontario and five other regions of Canada can be explained by differences in union status, industrial structure, job conditions and demographic characteristics. While observable factors were relatively inefficient in explaining differences in average work hours, they were more efficient in explaining regional differences in the share of individuals working a short year (fewer than 1,500 hours). For example, 'observables' explain almost entirely why workers in Quebec and in Manitoba–Saskatchewan were more likely to work a short year than their Ontario counterparts. In addition, one third to two thirds of the differences in the share of individuals working between 1,900 and 2,300 hours a year could be attributed to observables. Of the observables, differences in union status and demographic characteristics explained very little of the differences in work hours. Differences in industrial structure and in job conditions (including firm size and management responsibilities) explained more of the differences. However, observables did not explain differences in long work hours, did not entirely explain the larger share of workers with short years in the Atlantic and in British Columbia, and did not explain the

large incidence of the low full-year, full-time schedule in Quebec (between 1,500 to 1,900 hours per year). These remaining differences suggest that unobservable factors also contribute to exacerbate differences in regional work hours.

1. Introduction

In recent years, international differences in working hours have been the focus of a substantial body of research. These differences are interesting for several reasons. First, working time is closely related to gross domestic product (GDP) per capita, and examining differences in working time provides a better understanding of differences in aggregate economic growth (Armstrong, Harchaoui, Jackson and Takhani, 2002; Heisz and LaRochelle-Côté, 2003). Second, working time patterns have been related to a wide variety of well-being indicators at the individual and family level (Pannozzo and Colman, 2004; Higgins and Duxbury, 2002; Shields, 1999; Frederick and Fast, 1998; Williams, 2003; Scott, Tompa and Trevithick, 2004).

Much less attention has been paid to regional differences in work hours, even though, in some cases, differences in average annual work hours are of an order of magnitude that is similar to that of the Canada–U.S. difference in work hours. Furthermore, large differences in the regional distributions of work hours also exist. With the possible implications of these differences on aggregate economic growth and well-being, it appears that a detailed examination of regional working time differences is long overdue.

The causes of differences in work hours are widely debated. Generally speaking, these can be divided into 'observables' and 'unobservables' (or more accurately, factors that are difficult to observe in household surveys). The objective of this paper is to investigate regional differences in annual working hours. Beyond providing descriptive evidence, this paper also attempts to determine how much of these differences can be explained by differences in union status, industrial structure, job conditions and demographic characteristics. If all of the regional differences in work hours were explained by these 'observable' factors, then the importance of 'unobservable' factors (including preferences for leisure, institutional differences, incentives related to wage inequality and possible tax disincentives) in explaining work hours differences across regions would be overstated.

This paper uses data from the 2004 Survey of Labour and Income Dynamics and a method developed in Dinardo, Fortin and Lemieux (1996; henceforth referred to as 'DFL') to decompose the distribution of work hours. This method allows us to work with the entire density of hours to construct a counterfactual distribution of work hours that would prevail in a given region if workers had the same observational characteristics across regions.

We proceed in two stages. First, we use an Oaxaca decomposition to examine the share of the difference in average annual work hours between Ontario (the region of reference), and five other regions of Canada (the Atlantic[1], Quebec, Manitoba–Saskatchewan, Alberta, and British Columbia) that can be explained by the four observable factors listed above. Second, we describe regional differences in work hours distributions, and we apply the method developed in DFL to estimate how much of the distributional differences between Ontario and the five other regions can be attributed to these four observable factors.

1. Newfoundland and Labrador, Prince Edward Island, Nova Scotia and New Brunswick.

2. *Background*

International comparisons of work hours have generated a good deal of interest among both academics and public policy makers. Multiple-country comparisons of work hours are published and updated on a regular basis (Organisation for Economic Co-operation and Development [OECD], 1995, 1997, 2001, 2004; van Ark, 2002). Examples of exhaustive studies focusing on international differences in working time also abound. Most recently, differences in work hours between the United States and Germany have been well-documented and substantially debated (Bell and Freeman, 1996, 2000, 2001; Osberg, 2001). Similarly, the cross-sectional Canada–U.S. gap in work hours has also been the focus of many studies investigating differences in living standards between the two countries (Sharpe, 2003; Fortin, 2003; Institute for Competitiveness and Prosperity, 2006) or describing the historical evolution of annual work hours (Heisz and LaRochelle-Côté, 2003). With the recent development of international sources of labour data, it is likely that inter-country comparisons of work hours will continue to generate a substantial level of attention.

International differences in work hours matter for several reasons. By definition, hours are related to GDP per capita, an often-examined indicator of economic growth (Armstrong, Harchaoui, Jackson and Takhani, 2002). Moreover, there is a growing literature on the effects of working time on well-being (Pannozzo and Colman, 2004; Higgins and Duxbury, 2002), including ill effects associated with too much work (Shields, 1999; Frederick and Fast, 1998; Williams, 2003) or lack of it (Scott, Tompa and Trevithick, 2004).

Interestingly, fewer studies focus on explaining differences in work hours *within* countries, even though most of the discussion above also applies to regional differences in work hours. This includes Canada, where differences in work hours across regions and provinces have been clearly highlighted in the recent past. In describing the results of a survey of individuals working in large firms, Higgins and Duxbury (2003) noted substantial differences in working time patterns across the regions of Canada. Fortin (2003) also points to substantial differences in working time patterns between Ontario and Quebec.

Regional differences in average annual work hours for the most recent year available in the 2004 Survey of Labour and Income Dynamics (SLID) are shown in Figure 1 for prime-aged workers (workers aged 25 to 54). Workers in Alberta had the most hours, with an average 1,880 hours per year among all prime-aged individuals, which is the equivalent of 36 hours per week for a full-year worker. Workers in Manitoba–Saskatchewan and Ontario were not far behind, with 1,860 and 1,850 hours respectively. However, average hours were lower in the Atlantic (1,780 hours), British Columbia (1,790 hours) and Quebec (1,750 hours).[2] In some cases, regional differences in average hours were of a similar magnitude to that of the Canada–U.S. gap in work hours.[3]

2. Figures for average annual hours are rounded to the nearest 10.

3. The Survey of Labour and Income Dynamics (SLID) is the only individual-based survey that provides direct information about annual work hours. Statistics Canada also produces estimates of hours actually worked per worker and per year on a regular basis for the purpose of generating labour productivity estimates consistent with the System of National Accounts using data from various surveys of establishments and households. The estimates of annual work hours per worker also point to substantial differences in regional work hours, with relatively fewer hours being worked in Quebec and British Columbia, and more hours being worked in Alberta (CANSIM Table no. 383-0009).

While similar trends could be found for men and women, differences were even larger among men. Men in Manitoba–Saskatchewan and in Alberta worked the most hours (2,080 and 2,060 hours respectively), and men in Quebec worked fewer hours than in any other region on average (Figure 2). The number of hours worked by women in the Atlantic, Quebec and British Columbia was below the Canadian average, and women in Ontario worked the most hours with about 1,700 hours per year on average (Figure 3).

A better understanding of regional work hours also requires us to look at the distributions. In all regions, distributions are characterized by response heaping at around 1,304, 1,564, 1,825, 1,955, 2,086, 2,190, 2,294 and 2,607 hours, corresponding to 25, 30, 35, 37.5, 40, 42, 44 and 50 hours per week worked for full-year schedules. Accordingly, we compute descriptive statistics for reasonable intervals of the work hours distribution, orienting the most important response spikes near to the centre of the intervals. Table 1 shows the intervals used. We refer to work years in the 1,900-to-2,300-hours range as an "ordinary full year, full time" schedule. "Low full year, full time" refers to the equivalent of a full-year schedule of 29 to 37 hours per week. Two schedules of short-year work are also defined. Readers should note that these schedules could be derived from various combinations of part-year and/or part-time work. Finally, there are two schedules of long-year work.

Table 2 shows the distribution of annual work hours for all regions in 2004 and also reveals interesting differences across regions. In the Atlantic, fewer individuals had an ordinary full-year, full-time schedule. Among prime-aged men, the distribution was highly skewed: only 51.7% had an ordinary full-year, full-time schedule (compared with 67.2% of all prime-aged men in Ontario) with many other men working either a long or a short year: 12.8% of all prime-aged men worked fewer than 1,100 hours, but as many as 17.5% of them worked at least 2,300 hours.

The distribution of work hours in Quebec was also quite different from other distributions. First, Quebec had a much larger share of individuals working low full-year, full-time hours (especially among women)—and a smaller share of workers with ordinary full-year, full-time hours (43.7% vs. 57.0% in Ontario). In fact, the low full-year, full-time schedule appears to be a distinctive Quebec phenomenon, as it affected one in five working men and one in three working women in this province—nearly twice the rate observed in the five other regions. Second, the long-year schedule was less prevalent in Quebec, especially among women. Only 2.6% of women aged 25 to 54 worked 2,300 hours and over in 2004, half the share of Ontario women working a long year.

In Ontario, 57.0% of all workers and more than two thirds of working men had an ordinary full-year, full-time schedule—more than in any other region. As a result, Ontario had relatively fewer individuals working fewer than 1,500 hours (18.7%) and also had fewer individuals working a long year (8.4%) than in all other regions except Quebec. Similar trends could be found across gender lines.

Workers in Manitoba–Saskatchewan and in Alberta were more likely to work a long year. Compared to Ontario, these two regions also had a larger share of prime-aged women working a short year and a smaller share of workers with full-year, full-time schedules. This shows that the distribution may be different across two regions even when average hours are similar, and also suggests that an examination of differences over the entire distribution is necessary to better understand regional differences in work hours.

British Columbia had relatively fewer full-year, full-time workers and more workers with fewer than 1,500 hours compared to Ontario. Unlike the Atlantic, differences were most important among women, who were more likely to work short years than in any other region: 35.6% of working women in British Columbia worked fewer than 1,500 hours in 2004, and only 58.6% worked between 1,500 and 2,300 hours (compared with at least 62.0% in all other regions).

What explains regional differences in work hours? Some of these may be due to unobservable factors, which are not easily quantifiable by household surveys. Others may be due to observable factors—those that can be readily quantified in surveys. As stated in the introduction, our objective is to see how much of the regional differences in work hours can be explained by factors which are observables. We discuss these two groups of factors in the next few pages.

Unobservables

Unobservables (factors that are difficult to observe in household surveys) that might explain differences in work hours between the regions of Canada include incentives related to wage inequality, possible tax incentives (or disincentives) built upon progressive taxation policies, differences in macroeconomic factors, in local preferences and tastes, and in the shape of institutions. It should be noted that our objective is just to describe these factors, and not to evaluate their contribution in explaining differences in work hours.

(1) Wage inequality

In a series of articles, Bell and Freeman (1996, 2000, 2001) outlined the hypothesis that workers were 'forward looking' as they respond to the distribution of wages by working harder to obtain future raises and promotions, and suggested that workers in a country with more wage inequality had a higher incentive to work longer hours. According to this reasoning, workers in a region with more wage inequality may be encouraged to work longer hours in order to reach the upper echelons of society. Conversely, the incentive to work harder might be lower in regions with less wage inequality. According to this view, more wage inequality should result in longer hours among all groups, but especially among those that are at the top of the work hours distribution where the returns to extra work are presumed to be highest. Figure 4 shows the relationship between provincial wage inequality (as measured by the Gini coefficient) and average work hours in the top quintile of the work hours distribution. Clearly, there are large and important differences in wage inequality across provinces. However, from this simple analysis, it does not appear to strongly influence work hours.

(2) Taxes

It is often suggested that taxes act as a powerful disincentive to work longer hours, especially for those that are at the top of the work hours distribution. While labour economic theory suggests that decisions related to the supply of labour should be related to marginal tax rates (Blundell and Macurdy, 1999), it is very difficult to gauge the effect of taxes on hours in a robust fashion because hours are endogenously related to the labour supply choices of individuals (Devereux, 2004). Government taxation 'efforts' can be proxied by calculating the extent to which taxes contribute to reducing income inequality within provinces. This is done through comparing the Gini coefficient for after-tax income with the one for before-tax income. This difference reflects the extent of tax redistribution and is representative of the average tax rate and the progressivity

of the taxation system in a province.[4] Hence, we plot the reduction in income inequality against differences in average provincial work hours, with results shown in Figure 5. Indeed, the total redistribution implicit in the personal income tax system does appear to be associated with working hours, with Quebec and Newfoundland and Labrador showing higher tax redistribution but lower average hours.

(3) The influence of macroeconomic factors

Previous research has shown that the evolution in the Canada–U.S. hours gap tended to coincide with business cycle developments reflected in the Canada–U.S. unemployment gap (Heisz and LaRochelle-Côté, 2003). Similarly, if a given region has more individuals living in 'economically depressed' areas, it may have a larger share of individuals dealing with weaker labour demand conditions. According to this line of reasoning, it should be relatively more difficult to achieve a desirable level of work hours in areas with low labour demand. In Figure 6, we show the relationship between provincial differences in hours per worker and unemployment rates, which can be used as a proxy for local labour demand conditions. Clearly, more spells of unemployment during the year would negatively affect annual work hours. Presumably if regional unemployment rates were more similar, differences in working hours would be reduced. However, regional differences in unemployment are, in part, related to structural differences, and not solely to the business cycle.

(4) Local preferences and shape of institutions

The influence of preference and differences in lifestyle are sometimes mentioned in possible sources of working hours differences in international studies. In his examination of U.S.–German differences in work hours, Osberg (2001) notes that the main difference in annual hours worked per person between the two countries mostly arises from the lower propensity of women and older men to be employed, and concludes that work hours differences are better described by national differences in lifestyle and preferences. While differences in preferences are typically difficult to observe in survey data, it is at least possible to derive some inferences about preferences in work hours by using data from the most recent version available of the Workplace and Employee Survey (WES). The WES asks questions to a representative sample of workers on whether they would prefer to work more hours for more pay, fewer hours for less pay, or the same number of hours for the same pay.[5] Results for the 2003 WES are shown in Table 3.

Interestingly, not all regions share similar preferences in working time. Despite working lower hours than in the rest of the country, workers in the Atlantic, Quebec and in British Columbia reported higher levels of satisfaction with their current levels of working hours. Among those that were not satisfied with their current working schedule, workers in Quebec and in British Columbia were least likely to indicate that they wanted to increase their time at work—two provinces where the number of working hours is lower than the Canadian average. Furthermore, women workers dissatisfied with their jobs were proportionately more likely to wish for a *reduction* in work hours in Quebec and in British Columbia. Finally, it should be noted that the highest proportions of workers who would like to work more can be found in Ontario and in

4. Including the federal government.

5. The Workplace and Employee Survey excludes most workers from the agricultural sector and all workers from the public sector.

Manitoba-Saskatchewan—two regions where individuals are already working relatively long hours.

Another possibility often raised in explaining differences in work hours is the shape of institutions, including differences in labour market regulations. For instance, the regular workweek for the public service is 35 hours per week in Quebec, compared to at least 37.5 hours per week in most other provinces. It appears that this shorter workweek is also observed in other sectors of the economy in Quebec. Furthermore, institutional differences might well be the result of differences in collective preferences expressed through political channels. This makes it difficult to separate the issue of institutions from the issue of preferences.

Observables

'Observables' refer to a set of factors influencing work hours that are readily available from household surveys. These include differences in union status, industrial structure, job conditions and demographic characteristics. It is often argued that differences in work hours could be due to compositional differences across these factors. This sub-section provides a brief overview of these arguments.

(1) Union status

Differences in union status are often mentioned as one possible source of differences in work hours—especially in Quebec. In a study focusing on the particular case of the province of Quebec, Fortin (2003) noted that decisions related to working time may be the result of "collective action through...labour unions, and therefore sometimes seem imposed on individuals instead of reflecting their voluntary decisions" (p. 41) and that unions were more likely to secure shorter workweeks and longer vacation time for their members. Hence, it may be that workers are working fewer hours in regions where the involvement of unions seems to be more extensive (particularly in Quebec).

(2) Industrial structure

Observable factors that may explain regional discrepancies in work hours also include differences in the industrial structure. In seasonal industries, for instance, some work can be done only over a few weeks. Workers in seasonal and primary industries also face a stronger probability of being laid off (Heisz and Côté, 1999; Statistics Canada, 1998) and to work unstable hours (Heisz and LaRochelle-Côté, 2006). Hence, workers in regions with a larger proportion of seasonal and primary industries may be more likely to work fewer hours than those in other regions. Workers in education services also typically work fewer hours on an annual basis, due to a reduction of activities during the summer.

(3) Job conditions

Differences in job conditions may also be instrumental in explaining work hours differences across regions. These factors include the size of the firm and the management responsibilities of individuals. It is important to account for the size of the firm because workers in small firms are typically more likely to be laid off (Statistics Canada, 1998) and more likely to deal with unstable job conditions (Drolet and Morissette, 1998). Furthermore, it is also important to account for management responsibilities because managers are much more likely to work longer

hours (Heisz and LaRochelle-Côté, 2006). As a result, workers in a region with fewer workers in management functions may be less likely to put in long hours.

(4) Demographic characteristics

Demographic differences across regions may also play a role in explaining differences in work hours. Labour supply decisions are often related to a wide variety of demographic factors. Young mothers, for instance, are more likely to work part time because they are caring for children (Statistics Canada, 2005). Other studies have shown that individuals working shorter hours were more likely to be women with children, single men without children, young, less educated, and to have shorter job tenures (Heisz and LaRochelle-Côté, 2006). Some of these characteristics do not vary considerably across regions, but others—such as the education level and the years of experience on the labour market—may vary across regions.

3. Data and method

In this study, we use annual work hours information from the 2004 Survey of Labour and Income Dynamics (SLID)[6] for prime-aged individuals (aged 25 to 54). We select this age group because prime-aged individuals are typically more engaged into the labour market, and may be more likely to share similar preferences in working time.

In SLID, respondents are asked each year to describe their work schedules, which are then aggregated into a figure for annual working hours. Hours worked are collected by asking paid workers for how many hours they "usually" get paid in a typical workweek and by asking self-employed workers how many hours they "usually" work each week. A typical workweek refers to the number of hours one should normally work during one week. It includes time off for holidays, paid sick leave or maternity leave and usual paid overtime, but excludes paid overtime and all unpaid hours. These questions are asked for each job held by the individual in the year (up to a maximum of six) and not for all jobs together. Unpaid absences are subtracted from the usual work hours schedule. The information about weekly hours worked in every job held during the year is put together with other information collected by the survey about weeks worked to compute individual estimates of annual hours worked.[7] Our sample from SLID includes approximately 19,500 prime-aged individuals who worked on at least one occasion in 2004.[8]

Self-employed workers were excluded from our sample. Unlike paid workers, self-employed workers have the ability to choose their work hours more freely. Self-employment also includes a wide range of experiences and working conditions, making it difficult to draw clear inferences

6. This corresponds to the most recent year available in SLID.

7. For more details about the collection of annual work hours in SLID, see Bartman and Garneau (1998).

8. Many observations from SLID had missing values for work hours and for some other important variables. A missing value indicates that the respondent was not interviewed or did not provide an answer. This is mostly because SLID gives positive weights to all the members of a household if data were collected for at least one of them for either the labour portion or income portion of the survey. The descriptive statistics in Section 2 exclude missing observations for work hours. The results of Sections 4 and 5 exclude missing observations for work hours and for union status, industrial structure, job conditions or demographic characteristics. In all cases, we adjusted the weights of the remaining sample upwards proportionately to compensate.

about the impact of working time on the well-being of such a wide variety of individuals. Hence, this study focuses on paid workers only.

We use the Oaxaca (1973) decomposition to examine the possible impact of compositional differences in union status, industrial structure, job conditions and demographic characteristics on regional differences in work hours. These decompositions work on simple counterfactuals such as: "What would be the average level of work hours in a given region (Quebec, for instance) if it had the same observable characteristics as another region of reference?" Hence, we run five separate Oaxaca decompositions to identify the part (if any) of regional differences in work hours between Ontario (the most populous region) and the five other regions that can be explained by differences in observables.

While we use the Oaxaca decomposition to decompose differences in average work hours, it is also possible to decompose differences in the distribution of work hours by using the conditional density estimation method of DiNardo, Fortin and Lemieux (1996). This semi-parametric procedure relies on the imposition of counterfactuals on the observed distribution of the variable of interest (e.g. work hours). While the Oaxaca decomposition focuses on means alone, this method allows us to work with the entire density of hours to build 'counterfactual' densities that would have prevailed in a given region if the characteristics were the same as another region of reference (Ontario). These counterfactual densities can be estimated by 'reweighting' all observations on a sequential basis to evaluate the contribution of observable factors in explaining regional differences in work hours. Readers interested in the details will find a complete description of this procedure in Appendix A. Results from the Oaxaca decomposition and the DFL procedure are shown in the next two sections.

4. Explaining differences in average annual work hours

Differences in average work hours by union status, industrial structure, job conditions and demographic characteristics are shown in Tables 4 to 7, along with the corresponding distribution of workers for each region. Table 4 indicates that unionization rates varied quite largely across regions, from nearly 40% in Quebec and in Manitoba–Saskatchewan to 26% in Alberta and 30% in other regions. However, differences in work hours between unionized and non-unionized workers were generally small. This is important because it suggests that differences in union status, however large, might not be very helpful in explaining regional differences in average work hours.

Differences across industries are shown in Table 5. Not surprisingly, Quebec and Ontario had proportionately more workers engaged in manufacturing, and workers in Alberta were much more likely to work in the oil and gas sector. Furthermore, workers in the Atlantic and in British Columbia were more likely to work in consumer services. In terms of hours, workers in oil and gas industries were generally busier than other workers, with 2,170 hours per year on average. Conversely, workers in consumer services and in education services worked relatively fewer hours on average (1,650 and 1,670 hours respectively). These results are consistent with the greater use of part-time work and the large permanent layoff rates observed in consumer services (Statistics Canada, 1998) and the more moderate levels of activity in schools during the summer. This also suggests that differences in regional work hours might be related in part to industrial structure differences.

Table 6 reports differences in average work hours across job conditions. Workers in the Atlantic were more likely to work in smaller firms, and Ontario workers were proportionately more likely to work in large firms. Workers in Quebec and in the Atlantic were less likely to be working as managers. Because top managers typically work much more, and because workers in small firms (with fewer than 20 employees) typically work fewer hours, some of the differences in work hours across regions could also be the result of regional differences in job conditions.

Finally, differences in work hours across demographic characteristics (age, family situation, work experience, and education level) are shown in Table 7. As expected, younger individuals, single and married women with children, workers with fewer years of experience, and workers in occupations requiring no more than high-school education worked fewer hours than others. While work hours varied extensively across demographic characteristics, the distribution of workers across these characteristics did not vary considerably across regions. As a result, the part of differences in work hours that can be attributed to demographic differences is likely to be small.

The results of the Oaxaca decomposition are shown in Table 8. The first column indicates by how much the average hours in the region differ from those of Canada's largest region (Ontario). The second column shows the differences that would prevail if unionization rates were similar (holding everything else constant). The third column indicates the extent of these differences when industrial differences are accounted for. The fourth column accounts for job conditions, and the fifth considers all observable factors, including demographic characteristics. The results indicate that differences in observable factors generally explained little of differences in average work hours between Ontario and the other regions (with the possible exception of job conditions in the Atlantic and in British Columbia). This was not entirely unexpected, as Tables 4 to 7 also indicated that many of the overall differences in regional work hours also remained *within* groups, which limits the amount of regional differences that could be explained by compositional differences.

However, the main limitation of the Oaxaca decomposition is that it solely focuses on the mean, thus hiding possible differences in other parts of the work hours distribution, and ignoring the potential of other observable factors in explaining these distributional differences. For example, unions are often cited as a possible factor in preventing workers from working overtime hours. Hence, it might be that differences in unionization rates are much more effective in explaining differences at the top of the work hours distribution. In the next section, we turn our attention to the distribution of work hours, and we attempt to explain differences between the Ontario distribution and the other regional distributions through the estimation of counterfactual densities based on our four observable factors.

5. Explaining differences in the distribution of annual work hours

Results from the decomposition method used for the distribution of annual work hours are shown in Tables 9 to 13, with Table 9 showing the actual distributions. Table 10 shows the counterfactual distributions of work hours when differences in the union status are accounted for. The first panel shows the distribution in work hours that would prevail if all regions had identical union participation rates. The second panel shows the percentage difference from the Ontario distribution when differences in union status are accounted for (conditional on industrial

structure, job conditions, and demographic characteristics). The third panel shows the incremental effect of union status to the distributional differences in work hours.

Table 10 indicates that regional differences in the distribution of work hours would not be much different from what we observed in Table 9 if all regions had the same level of union coverage. This suggests that union coverage contributes little to explain regional differences in the distribution of annual work hours.

Table 11 shows differences in work hours when compositional differences in the industrial structure are accounted for (in addition to the union status). If all Canadian workers were distributed similarly to those across Ontario industries, the share of workers with an ordinary full-year, full-time schedule would rise in all regions, more particularly in the Atlantic (+2.3%), in Manitoba–Saskatchewan (+2.2%) and in Alberta (+3.5%). In the Atlantic and in Alberta, the increase in the share of individuals working standard hours would be accompanied by reductions in the shares of workers with both a short and long work-year. In other regions, these changes would mostly be the result of reductions in the shares of workers with fewer than 1,500 hours. While substantial differences would remain between the distributions of Ontario and Quebec, and the Atlantic and British Columbia, even after controlling for industry characteristics, it should be noted that the distributions of Alberta, Manitoba–Saskatchewan and Ontario would be much more alike if they had similar industry characteristics.

Remaining differences in work hours when union status, industrial structure and job conditions (firm size and management characteristics) are accounted for are shown in Table 12. Clearly, differences in job conditions are associated with the larger share of individuals working a short year in the Atlantic, Quebec and British Columbia. In these regions, fewer workers would be working a short year, and more would be working on an ordinary full-year, full-time basis if they had the same job conditions as in Ontario.

Finally, results accounting for all factors—including demographic characteristics—are shown in Table 13. These characteristics include gender, age, experience, education level and family status. Demographic differences explain little of the remaining differences in the distribution of work hours. This is consistent with Table 7, which indicated that demographic characteristics did not vary considerably across regions.[9]

How much of the initial distributional differences observed between regions were explained by observable factors? One way to answer this question is to examine the differences between Ontario and the other regions that would prevail in various parts of the distribution when all observable characteristics are controlled for. Results are shown in Figures 7 to 10.

Figure 7 reports the differences in the shares of individuals working short years (combining very short year and short year categories), or fewer than 1,500 hours a year. It shows that differences in observables are relatively efficient in explaining regional differences in the bottom of the distribution. Depending on the region, one third to all of the differences in the shares of workers

9. On account of the limited size of the sample, our demographic characteristics do not include the immigration status. This is potentially important because the share of foreign-born individuals is much larger in Ontario (and British Columbia) than in other regions. Differences due to the immigration status are therefore included in the unobservables. However, the relationship between immigrant status and work hours is not clear. While recent immigrants work fewer hours, older immigrants tend to work longer hours than their Canadian counterparts (Heisz and LaRochelle-Côté, 2006).

with fewer than 1,500 hours can be attributed to observables. Observables explain almost entirely why Quebec and Manitoba–Saskatchewan workers work more short years. Of the explained part, differences in the industrial structure and in job conditions typically explained most of the differences.

Figure 8 reports the differences in the shares of individuals working a long year (combining long year and very long year categories), or 2,300 hours or more per year. Clearly, observables are not very helpful in explaining differences at the top of the work hours distribution—except in Alberta, where differences in observables explained nearly half of differences in the share of individuals working more than 2,300 hours, mainly because of compositional differences in the industrial structure.

Differences in the shares of workers with an ordinary full-year, full-time schedule—between 1,900 and 2,300 hours per year—are shown in Figure 9. With the reduction of workers with a short year (shown in Figure 7), all regions would gain proportionately more full-year, full-time workers. Depending on the region, one third to two thirds of the initial differences between Ontario and the other regions could be related to differences in observables. Again, differences in the industrial structure and in job conditions accounted for most of the explained part.

Finally, differences in the shares of workers with a low full-year, full-time schedule—between 1,500 and 1,900 hours per year—are shown in Figure 10. In this case, the only significant difference—between Quebec and Ontario—does not appear to be related to differences in observables. Other differences were already very small.

Clearly, the effect of observables in explaining differences in annual work hours varied quite widely across the work hours distribution. While observables were relatively good in explaining differences at the bottom and in the middle of the distribution (between some regions), they were less efficient in explaining differences at the top of the work hours distribution, and were largely ineffective in explaining why Quebec had a larger share of workers with a low full-year, full-time working schedule. This suggests that a good deal of differences in annual work hours should be attributed to unobservables—most notably in the Atlantic, Quebec and British Columbia.

6. Conclusion

This study describes the difference in annual work hours among regions of Canada for 2004 using the Survey of Labour and Income Dynamics. The objective is to describe these differences and to determine how much of them could be explained by a basic set of observable factors, i.e. demographic characteristics, union status, industrial structure, and job conditions. We argue that if most of the inter-regional difference in work time can be explained by observables, then debate over the cause of regional difference can focus on these.

We find that these observables do not explain much of the regional difference in average work hours, but they are much better at explaining the differences in the shares of individuals working fewer than 1,500 hours (a short-year schedule). For example, observables explain almost entirely why workers in Quebec and in Manitoba–Saskatchewan were more likely to work short hours than their Ontario counterparts.

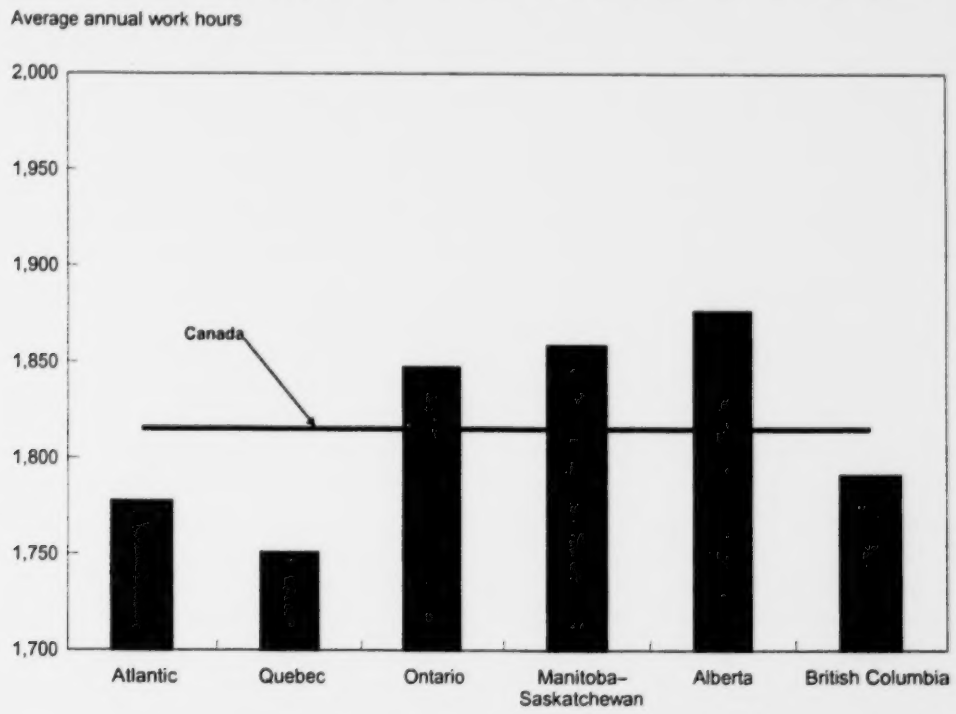
In addition, one third to two thirds of the differences in the share of individuals working between 1,900 and 2,300 hours a year (the ordinary full-year, full-time schedule) could be attributed to observables. Of the observables, differences in union status and demographic characteristics explained very little of the differences in work hours. Differences in industrial structure and in job conditions (including firm size and management responsibilities) explained more of the differences in work hours.

However, observables did not explain differences in the share of workers with a long work year (more than 2,300 hours), did not entirely explain the larger share of workers in the Atlantic and in British Columbia with a short-year schedule, and did not explain the large prevalence of the low full-year, full-time schedule (between 1,500 and 1,900 hours) in Quebec.

The differences that remain unexplained suggest that other factors also contribute to regional differences in work hours. These factors are unobservable in the sense that they are impossible or difficult to quantify with households surveys. These would include differences in incentives related to wage inequality and differences in taxes, in macroeconomic factors, in local preferences and tastes, and in the shape of institutions.

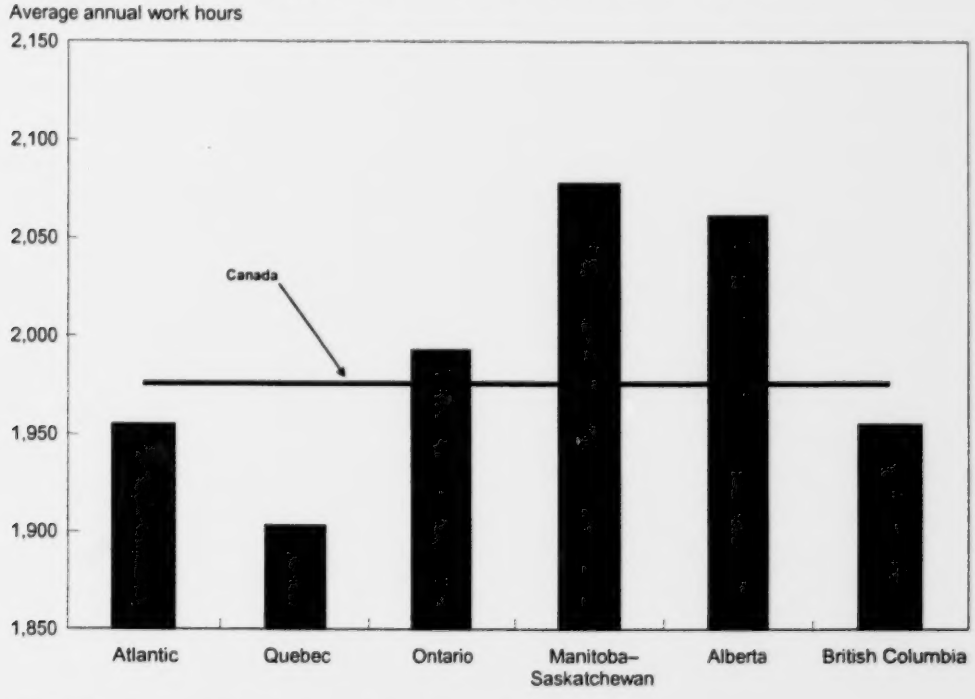
While the relative contribution of unobservable factors in explaining differences in work hours is unclear, it is likely that different factors are at work in different regions. For instance, results from the 2003 Workplace and Employee Survey indicated that differences in local tastes and preferences may explain why workers in Quebec and in British Columbia are working fewer hours. In Quebec, the prevalence of the 35-hour workweek suggests that the shape of institutions might also be playing a role. In the Atlantic, the fact that so many prime-aged men are working fewer than 1,100 hours per week suggests that local economic conditions could be an important factor in explaining differences in work hours. Furthermore, second-order effects may also be at work. For example, high unionization rates in Quebec might affect work hours in both the unionized and non-unionized sectors. More research will be needed to understand the impact of these factors in explaining regional differences in work hours.

Figure 1 Average annual work hours by region among working men and women aged 25 to 54, 2004



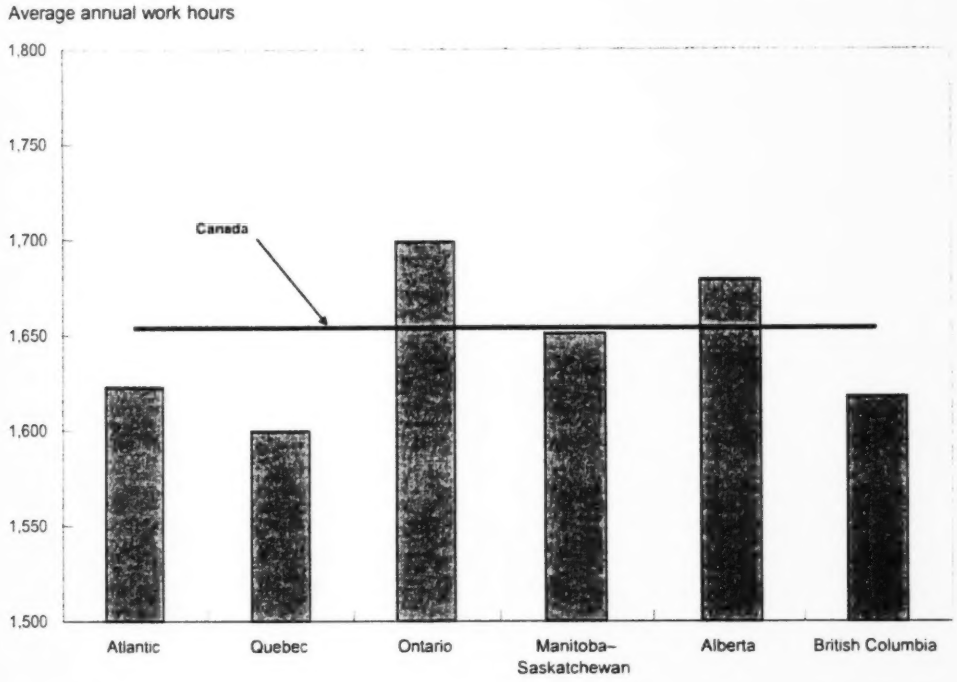
Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Figure 2 Average annual work hours by region among working men aged 25 to 54, 2004



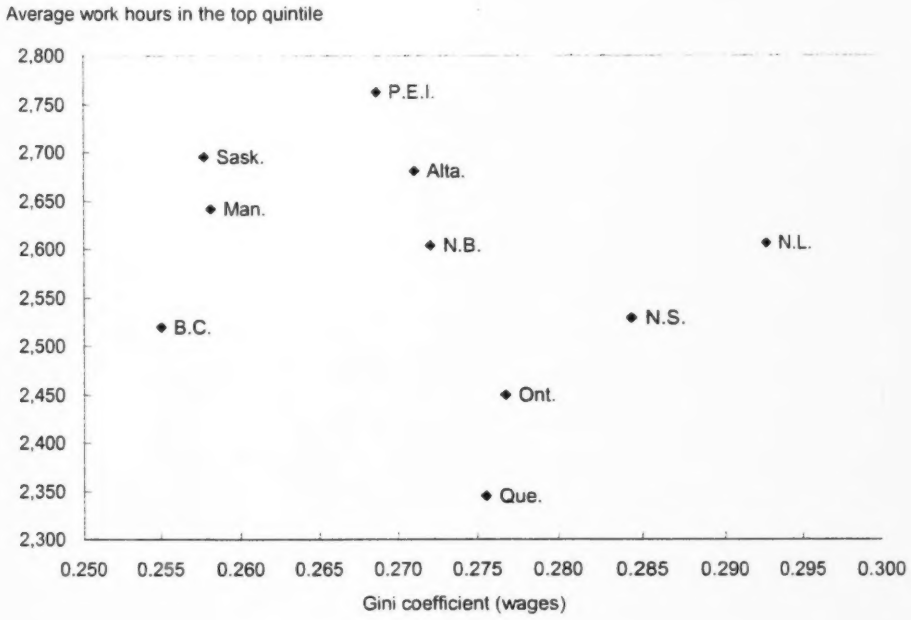
Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Figure 3 Average annual work hours by region among working women aged 25 to 54, 2004



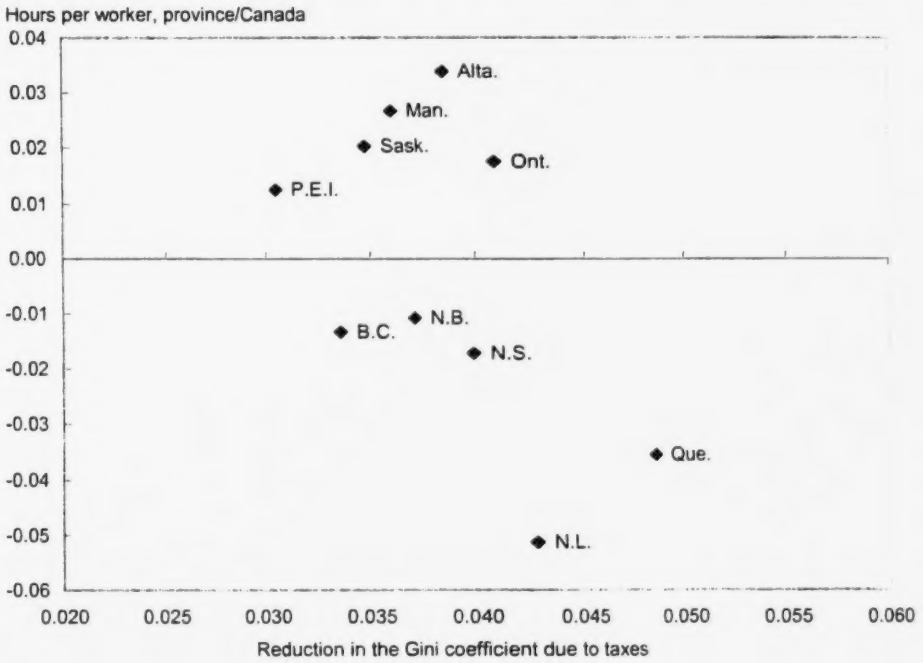
Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Figure 4 Gini coefficient and average work hours in the top quintile among workers aged 25 to 54, 2004



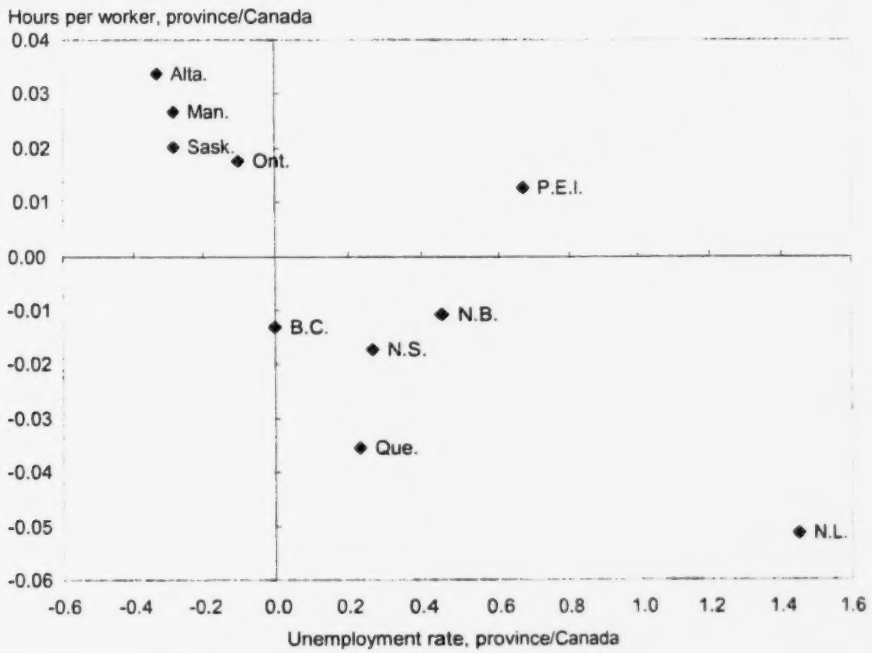
Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Figure 5 Reduction in income inequality due to taxes and relative hours among workers aged 25 to 54, 2004



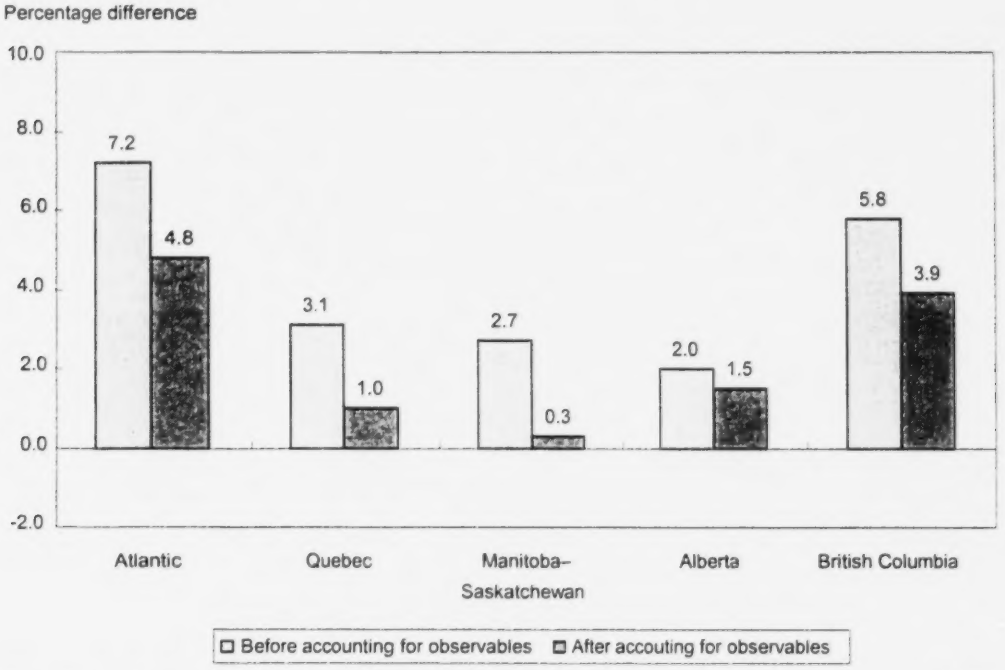
Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Figure 6 Unemployment rates and relative hours among workers aged 25 to 54, 2004



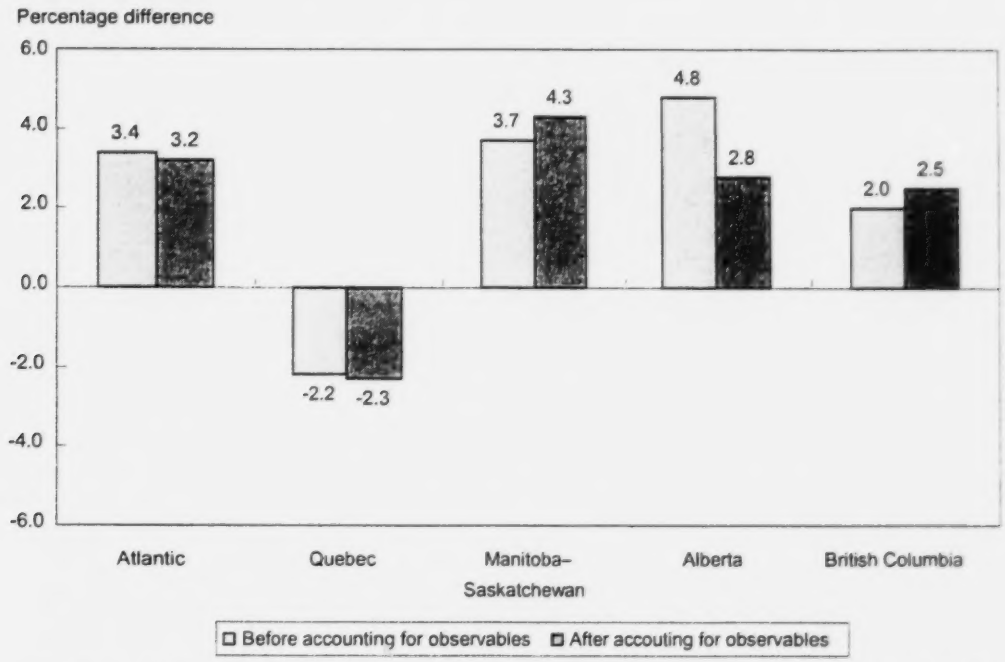
Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Figure 7 Percentage difference in the share of workers aged 25 to 54 working fewer than 1,500 hours per year (short year), 2004



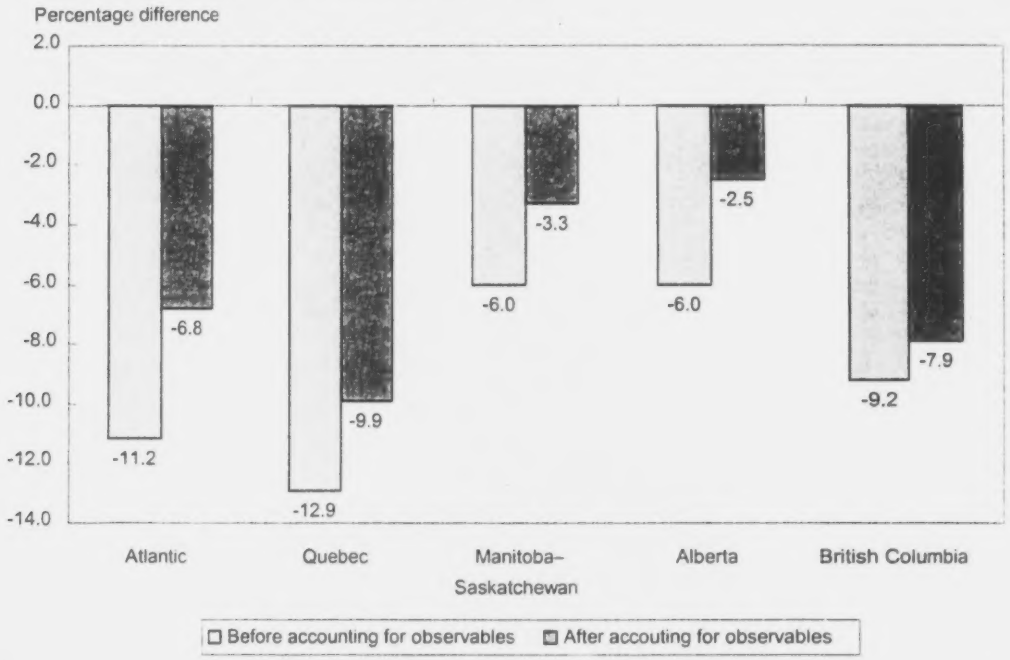
Note: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.
Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics

Figure 8 Percentage difference in the share of workers aged 25 to 54 working 2,300 hours or more per year (long year), 2004



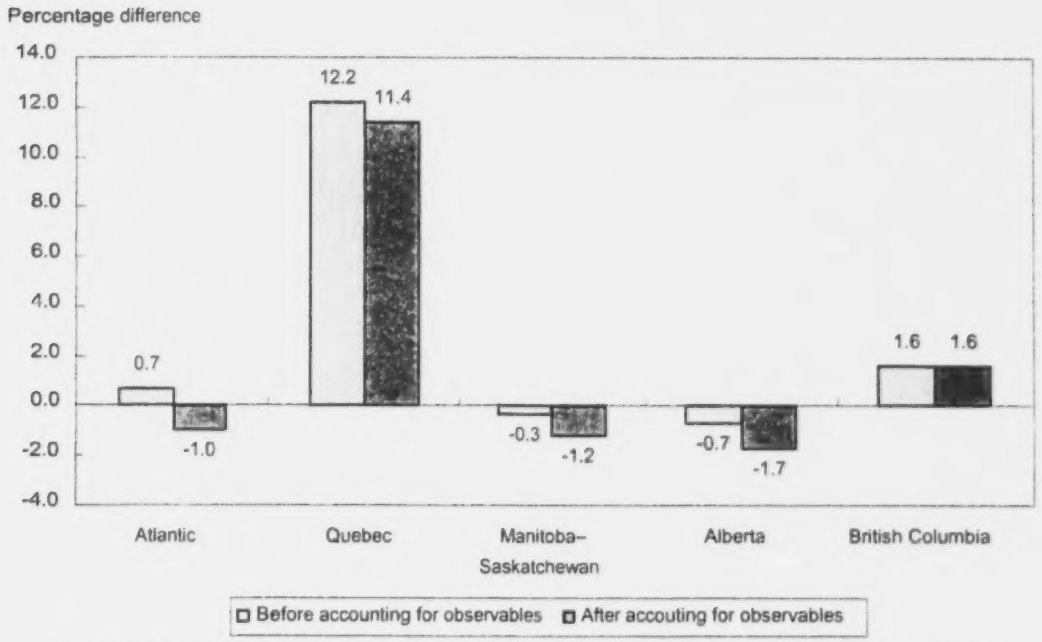
Note: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.
Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Figure 9 Percentage difference in the share of workers aged 25 to 54 working between 1,900 and 2,300 hours per year (ordinary full-year, full-time), 2004



Note: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.
Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics

Figure 10 Percentage difference in the share of workers aged 25 to 54 working between 1,500 and 1,900 hours per year (low full-year, full-time), 2004



Note: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.
Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table 1 Work hours categories and schedules

Categories, annual work hours	Categories, weekly work hours	Schedules
Fewer than 1,100	Less than 21	Very short year
1,100 to 1,500	21 to 29	Short year
1,500 to 1,900	29 to 37	Low full year, full time
1,900 to 2,300	37 to 44	Ordinary full year, full time
2,300 to 2,700	44 to 52	Long year
2,700 and over	52 and over	Very long year

Table 2 Percentage distribution of workers aged 25 to 54 across categories of annual work hours, by region, 2004

Categories of annual work hours	Atlantic	Quebec	Ontario	Manitoba–Saskatchewan	Alberta	British Columbia
	Percentage distribution					
All						
Fewer than 1,100	18.1	14.5	13.0	14.5	13.4	16.0
1,100 to 1,500	8.2	9.3	5.7	7.1	7.7	8.9
1,500 to 1,900	16.5	27.6	15.9	16.0	15.1	17.8
1,900 to 2,300	45.9	43.7	57.0	50.5	51.1	47.8
2,300 to 2,700	6.3	3.5	5.1	6.1	6.1	4.6
2,700 and over	4.9	2.5	3.3	5.8	6.4	5.0
Men						
Fewer than 1,100	12.8	9.0	8.0	7.3	6.9	9.2
1,100 to 1,500	6.5	6.4	2.9	4.0	5.0	5.9
1,500 to 1,900	11.5	19.9	11.0	11.4	10.9	12.5
1,900 to 2,300	51.7	55.7	67.2	59.7	60.0	59.4
2,300 to 2,700	9.6	5.1	6.8	8.9	8.1	6.4
2,700 and over	7.9	3.9	4.1	8.7	9.1	6.5
Women						
Fewer than 1,100	23.4	20.4	18.4	21.7	20.8	23.4
1,100 to 1,500	10.0	10.4	8.7	10.3	10.9	12.2
1,500 to 1,900	21.4	35.8	21.2	20.7	19.9	23.6
1,900 to 2,300	40.2	30.9	46.1	41.3	41.3	35.0
2,300 to 2,700	3.0	1.7	3.2	3.2	3.7	2.7
2,700 and over	2.0	0.9	2.4	2.8	3.5	3.3

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table 3 Proportion of workers[1] aged 25 to 54 who would like to work...

	... the same number of hours for the same pay	... fewer hours for less pay	... more hours for more pay
	Percentage distribution		
All			
Atlantic	73.3	5.3	21.4
Quebec	73.6	7.3	19.2
Ontario	66.9	7.2	25.9
Manitoba–Saskatchewan	67.0	4.9	28.1
Alberta	72.6	6.0	21.4
British Columbia	73.8	7.0	19.2
Canada	**70.4**	**6.8**	**22.8**
Men			
Atlantic	72.4	3.8	23.7
Quebec	73.3	6.3	20.3
Ontario	67.0	7.7	25.3
Manitoba–Saskatchewan	61.9	6.4	31.7
Alberta	71.5	5.2	23.3
British Columbia	70.4	6.0	23.6
Canada	**69.4**	**6.5**	**24.0**
Women			
Atlantic	73.8	6.4	19.8
Quebec	73.8	8.2	18.0
Ontario	66.8	6.7	26.5
Manitoba–Saskatchewan	71.8	3.4	24.7
Alberta	73.5	6.8	19.7
British Columbia	76.4	7.7	15.9
Canada	**71.3**	**7.0**	**21.7**

1. Excluding workers in the public service and in most agricultural industries.
Source: Statistics Canada, 2003 Workplace and Employee Survey.

Table 4 Percentage distribution and average work hours of workers aged 25 to 54, by union status, 2004

Union status	Atlantic	Quebec	Ontario	Manitoba–Saskatchewan	Alberta	British Columbia	All
	Percentage distribution						
Unionized	31.0	38.2	29.1	38.1	26.0	30.8	31.9
Non-unionized	69.0	61.8	70.9	61.9	74.0	69.2	68.1
	Average work hours						
Unionized	1,870	1,790	1,890	1,880	1,860	1,840	1,850
Non-unionized	1,760	1,750	1,840	1,860	1,900	1,790	1,810

Notes: Average work hours are rounded to the nearest 10. Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.
Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table 5 Percentage distribution and average work hours of workers aged 25 to 54, by industrial structure,[1] 2004

Industrial structure	Atlantic	Quebec	Ontario	Manitoba–Saskatchewan	Alberta	British Columbia	All
	Percentage distribution						
Agriculture	4.4	1.8	1.0	2.2	1.0	3.0	1.8
Oil and gas	1.3	0.6	0.5	2.2	7.4	1.0	1.5
Construction and utilities	7.4	5.9	6.1	5.9	7.9	5.8	6.3
Manufacturing	12.8	18.9	18.5	11.1	8.8	13.0	16.0
Consumer services	21.1	17.3	16.4	18.0	16.9	22.3	17.9
Business services	8.8	12.7	13.4	9.0	13.4	11.4	12.4
Education services	8.2	9.0	7.6	9.4	9.6	7.5	8.3
Health care services	14.2	13.1	11.1	15.3	12.0	10.8	12.1
Wholesale and transportation	8.5	7.2	9.0	9.7	9.5	11.7	8.9
Arts, entertainment and recreation	2.8	3.6	5.3	5.1	3.9	5.2	4.5
All other services	3.1	2.9	3.3	4.5	4.3	3.0	3.3
Public administration	7.2	7.1	7.9	7.5	5.2	5.5	7.0
	Average work hours						
Agriculture	2,010	1,840	1,780	2,150	2,230	1,830	1,900
Oil and gas	2,010	2,060	2,160	2,200	2,240	1,910	2,170
Construction and utilities	1,830	1,810	1,910	2,090	2,010	1,870	1,900
Manufacturing	1,880	1,940	1,990	1,970	2,050	1,900	1,970
Consumer services	1,650	1,630	1,610	1,760	1,760	1,690	1,650
Business services	1,810	1,770	1,880	1,830	1,870	1,820	1,840
Education services	1,720	1,540	1,750	1,710	1,670	1,690	1,670
Health care services	1,700	1,660	1,750	1,740	1,730	1,790	1,720
Wholesale and transportation	1,960	1,950	2,000	1,950	2,050	1,900	1,970
Arts, entertainment and recreation	1,770	1,830	1,920	1,850	1,970	1,690	1,870
All other services	1,700	1,710	1,900	1,850	1,750	1,890	1,820
Public administration	1,920	1,830	1,930	2,020	1,860	1,990	1,910

1. Based on the main job.

Notes: Average work hours are rounded to the nearest 10. Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table 6 Percentage distribution and average work hours of workers aged 25 to 54, by job conditions,[1] 2004

Job conditions	Atlantic	Quebec	Ontario	Manitoba–Saskatchewan	Alberta	British Columbia	All
	Percentage distribution						
Management level							
Top manager	5.1	7.1	7.1	6.8	7.5	7.0	7.0
Middle manager	8.9	5.9	10.6	9.7	11.4	9.8	9.2
Low manager	5.9	4.7	6.6	6.2	7.3	7.1	6.2
Not a manager	80.1	82.3	75.7	77.3	73.9	76.1	77.6
Firm size							
Less than 20 employees	24.4	19.9	17.6	22.8	19.6	25.3	20.1
20 to 99 employees	16.2	20.6	17.9	18.6	15.7	19.4	18.4
100 to 499 employees	13.3	16.1	15.1	16.8	17.5	16.5	15.7
500 to 999 employees	7.3	7.8	6.9	7.1	6.2	7.4	7.1
1,000 employees and over	38.8	35.6	42.6	34.5	41.1	31.5	38.6
	Average work hours						
Management level							
Top manager	2,080	2,070	2,110	2,130	2,160	2,160	2,110
Middle manager	2,040	1,910	2,000	2,090	2,010	1,950	1,990
Low manager	1,890	1,860	1,930	1,940	1,980	1,880	1,910
Not a manager	1,740	1,720	1,800	1,810	1,830	1,750	1,770
Firm size							
Less than 20 employees	1,690	1,610	1,740	1,780	1,750	1,710	1,700
20 to 99 employees	1,850	1,800	1,850	1,850	1,900	1,740	1,830
100 to 499 employees	1,760	1,800	1,900	1,880	2,000	1,880	1,870
500 to 999 employees	1,850	1,700	1,900	1,920	1,930	1,740	1,830
1,000 employees and over	1,830	1,840	1,880	1,920	1,890	1,900	1,830

1. Based on the main job.

Notes: Average work hours are rounded to the nearest 10. Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table 7 Percentage distribution and average work hours of workers aged 25 to 54, by demographic characteristics, 2004

Demographic characteristics	Atlantic	Quebec	Ontario	Manitoba–Saskatchewan	Alberta	British Columbia	All
	Percentage distribution						
Age							
25 to 34	31.1	33.0	33.6	33.1	35.7	33.4	33.4
35 to 44	35.5	34.0	36.7	33.1	33.7	34.7	35.2
45 to 54	33.3	33.0	29.6	33.7	30.6	31.9	31.4
Family situation							
Single women with children	5.8	6.5	5.0	6.1	5.0	5.4	5.6
Single women without children	8.9	11.6	11.1	8.6	8.9	11.5	10.7
Single men with children	1.5	2.8	1.3	1.7	1.8	2.0	1.8
Single men without children	11.6	15.6	15.6	13.7	16.8	15.0	15.2
Married women with children	24.7	21.9	24.2	26.5	23.0	20.9	23.3
Married women without children	10.8	8.2	7.9	8.6	10.2	9.8	8.7
Married men with children	26.2	25.4	26.8	26.7	24.1	25.9	26.0
Married men without children	10.4	7.9	8.0	8.0	10.1	9.5	8.7
Work experience[1]							
Less than 5 years	14.6	18.2	16.1	17.5	18.3	17.5	17.0
5 to 9 years	16.6	14.8	17.5	15.6	17.4	15.8	16.4
10 to 14 years	15.0	16.2	17.5	15.7	16.6	14.2	16.4
15 to 19 years	20.5	17.8	19.2	17.5	17.2	20.5	18.8
At least 20 years	33.3	33.0	29.6	33.7	30.6	31.9	31.4
Education level[2]							
Management education	6.5	8.3	8.8	8.8	9.3	8.8	8.5
University education	16.4	20.0	19.4	15.8	21.1	14.5	18.7
College education	30.0	30.8	28.5	32.1	30.3	29.7	29.7
High-school education	47.2	41.0	43.3	43.3	39.3	46.9	43.0

Table 7 Percentage distribution and average work hours of workers aged 25 to 54, by demographic characteristics, 2004 (concluded)

Demographic characteristics	Atlantic	Quebec	Ontario	Manitoba–Saskatchewan	Alberta	British Columbia	All
	Average work hours						
Age							
25 to 34	1,700	1,690	1,780	1,770	1,860	1,750	1,760
35 to 44	1,830	1,810	1,890	1,900	1,870	1,860	1,860
45 to 54	1,840	1,800	1,890	1,930	1,940	1,800	1,860
Family situation							
Single women with children	1,580	1,610	1,690	1,690	1,830	1,520	1,650
Single women without children	1,710	1,720	1,800	1,700	1,850	1,710	1,760
Single men with children	1,980	1,960	2,120	1,920	2,200	1,960	2,030
Single men without children	1,790	1,800	1,880	2,010	2,060	1,920	1,890
Married women with children	1,570	1,510	1,610	1,570	1,570	1,540	1,570
Married women without children	1,700	1,660	1,830	1,830	1,690	1,730	1,750
Married men with children	2,040	1,990	2,050	2,100	2,100	2,020	2,040
Married men without children	1,960	1,930	2,020	2,170	2,020	1,960	1,990
Work experience[1]							
Less than 5 years	1,660	1,650	1,760	1,740	1,910	1,700	1,730
5 to 9 years	1,740	1,730	1,800	1,800	1,800	1,810	1,780
10 to 14 years	1,820	1,820	1,890	1,860	1,850	1,820	1,850
15 to 19 years	1,830	1,800	1,880	1,940	1,880	1,900	1,860
At least 20 years	1,840	1,800	1,890	1,930	1,940	1,800	1,860
Education level[2]							
Management education	2,000	1,930	2,010	2,080	2,080	1,980	2,000
University education	1,850	1,760	1,870	1,790	1,890	1,810	1,833
College education	1,860	1,770	1,920	1,920	2,000	1,860	1,880
High-school education	1,700	1,730	1,770	1,810	1,760	1,740	1,750

1. We proxy work experience by computing age minus 25 for all individuals in the sample. The Survey of Labour and Income Dynamics has a variable indicating years of work experience, but too many observations are missing.
2. Based on skills required by the occupation (National Occupational Classification for Statistics 2001). The Survey of Labour and Income Dynamics has a variable for the education level, but too many observations are missing.

Notes: Average work hours are rounded to the nearest 10. Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table 8 Results from the Oaxaca decomposition, average work hours, 2004

	Total difference (from Ontario)	(a) Union status	(b) + industrial structure	(c) + job conditions	(d) + demographic characteristics
				(b)	(c)
Atlantic	**-60.0**	-62.4	-61.8	-43.0	-38.0
Quebec	**-86.5**	-94.5	-88.8	-71.9	-75.4
Manitoba–Saskatchewan	**13.7**	10.6	11.6	22.0	31.6
Alberta	**35.4**	36.3	35.4	34.6	26.4
British Columbia	**-46.1**	-45.8	-39.2	-18.7	-26.1

Notes: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. As a result, differences in average hours in this table might be slightly different from those presented in Figure 1. Weights for the remaining sample have been adjusted upwards proportionately to compensate.

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table 9 Percentage distribution of workers aged 25 to 54 across categories of annual work hours, 2004

Annual work hours	Atlantic	Quebec	Ontario	Manitoba–Saskatchewan	Alberta	British Columbia
	Percentage distribution (f_i)					
Fewer than 1,100	17.1	13.2	12.6	13.9	12.8	15.6
1,100 to 1,500	8.4	8.2	5.7	7.1	7.5	8.5
1,500 to 1,900	16.4	27.9	15.7	15.4	15.0	17.3
1,900 to 2,300	46.6	44.9	57.8	51.8	51.8	48.6
2,300 to 2,700	6.6	3.6	4.9	6.4	6.5	4.9
2,700 and over	4.9	2.3	3.2	5.4	6.4	5.2
	Percentage difference from Ontario					
Fewer than 1,100	4.5	0.6	...	1.3	0.2	3.0
1,100 to 1,500	2.7	2.5	...	1.4	1.8	2.8
1,500 to 1,900	0.7	12.2	...	-0.3	-0.7	1.6
1,900 to 2,300	-11.2	-12.9	...	-6.0	-6.0	-9.2
2,300 to 2,700	1.7	-1.3	...	1.5	1.6	0.0
2,700 and over	1.7	-0.9	...	2.2	3.2	2.0

... not applicable

Notes: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. As a result, the distributions of the first panel are slightly different from the results shown in Table 2. Weights for the remaining sample have been adjusted upwards proportionately to compensate.

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table 10 Percentage distribution of workers aged 25 to 54 across categories of annual work hours after accounting for union status, 2004

Categories of annual work hours	Atlantic	Quebec	Ontario	Manitoba–Saskatchewan	Alberta	British Columbia
	Percentage distribution (f_2)					
Fewer than 1,100	17.1	14.1	12.6	14.2	13.2	15.7
1,100 to 1,500	8.2	8.0	5.7	7.0	7.7	8.5
1,500 to 1,900	16.1	27.5	15.7	15.3	14.8	17.3
1,900 to 2,300	46.9	44.8	57.8	51.4	51.7	47.8
2,300 to 2,700	6.8	3.4	4.9	6.4	5.9	4.9
2,700 and over	4.9	2.3	3.2	5.7	6.7	5.8
	Percentage difference from Ontario, accounting for union status					
Fewer than 1,100	4.5	1.5	...	1.6	0.6	3.1
1,100 to 1,500	2.5	2.3	...	1.3	2.0	2.8
1,500 to 1,900	0.4	11.8	...	-0.4	-0.9	1.6
1,900 to 2,300	-10.9	-13.0	...	-6.4	-6.1	-10.0
2,300 to 2,700	1.9	-1.5	...	1.5	1.0	0.0
2,700 and over	1.7	-0.9	...	2.5	3.5	2.6
	Percentage contribution of union status (f_2–f_1)					
Fewer than 1,100	0.0	0.9	...	0.3	0.4	0.1
1,100 to 1,500	-0.2	-0.2	...	-0.1	0.2	0.0
1,500 to 1,900	-0.3	-0.4	...	-0.1	-0.2	0.0
1,900 to 2,300	0.3	-0.1	...	-0.4	-0.1	-0.8
2,300 to 2,700	0.2	-0.2	...	0.0	-0.6	0.0
2,700 and over	0.0	0.0	...	0.3	0.3	0.6

... not applicable

Notes: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table 11 Percentage distribution of workers aged 25 to 54 across categories of annual work hours after accounting for union status and industrial structure, 2004

Categories of annual work hours	Atlantic	Quebec	Ontario	Manitoba-Saskatchewan	Alberta	British Columbia
	Percentage distribution (f_3)					
Fewer than 1,100	16.9	13.4	12.6	14.0	12.6	15.1
1,100 to 1,500	7.7	7.4	5.7	6.1	7.0	8.7
1,500 to 1,900	15.2	27.4	15.7	14.1	14.0	17.0
1,900 to 2,300	49.2	45.8	57.8	53.6	55.2	48.7
2,300 to 2,700	6.6	3.7	4.9	6.6	5.2	4.7
2,700 and over	4.3	2.2	3.2	5.6	6.0	5.8
	Percentage difference from Ontario, accounting for union status and industrial structure					
Fewer than 1,100	4.3	0.8	...	1.4	0.0	2.5
1,100 to 1,500	2.0	1.7	...	0.4	1.3	3.0
1,500 to 1,900	-0.5	11.7	...	-1.6	-1.7	1.3
1,900 to 2,300	-8.6	-12.0	...	-4.2	-2.6	-9.1
2,300 to 2,700	1.7	-1.2	...	1.7	0.3	-0.2
2,700 and over	1.1	-1.0	...	2.4	2.8	2.6
	Percentage contribution of industrial structure (f_3-f_2)					
Fewer than 1,100	-0.2	-0.7	...	-0.2	-0.6	-0.6
1,100 to 1,500	-0.5	-0.6	...	-0.9	-0.7	0.2
1,500 to 1,900	-0.9	-0.1	...	-1.2	-0.8	-0.3
1,900 to 2,300	2.3	1.0	...	2.2	3.5	0.9
2,300 to 2,700	-0.2	0.3	...	0.2	-0.7	-0.2
2,700 and over	-0.6	-0.1	...	-0.1	-0.7	0.0

... not applicable

Notes: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table 12 Percentage distribution of workers aged 25 to 54 across categories of annual work hours after accounting for union status, industrial structure and job conditions, 2004

Categories of annual work hours	Atlantic	Quebec	Ontario	Manitoba–Saskatchewan	Alberta	British Columbia
	Percentage distribution (f_4)					
Fewer than 1,100	16.1	12.4	12.6	13.2	12.7	14.2
1,100 to 1,500	7.4	6.8	5.7	5.7	7.0	8.1
1,500 to 1,900	15.0	27.2	15.7	14.3	14.1	16.7
1,900 to 2,300	50.6	47.7	57.8	54.5	55.3	50.5
2,300 to 2,700	6.5	3.7	4.9	6.7	5.2	4.6
2,700 and over	4.3	2.1	3.2	5.6	5.8	5.9
	Percentage difference from Ontario, accounting for union status, industrial structure and job conditions					
Fewer than 1,100	3.5	-0.2	...	0.6	0.1	1.6
1,100 to 1,500	1.7	1.1	...	0.0	1.3	2.4
1,500 to 1,900	-0.7	11.5	...	-1.4	-1.6	1.0
1,900 to 2,300	-7.2	-10.1	...	-3.3	-2.5	-7.3
2,300 to 2,700	1.6	-1.2	...	1.8	0.3	-0.3
2,700 and over	1.1	-1.1	...	2.4	2.6	2.7
	Percentage contribution of job conditions (f_4-f_3)					
Fewer than 1,100	-0.8	-1.0	...	-0.8	0.1	-0.9
1,100 to 1,500	-0.3	-0.6	...	-0.4	0.0	-0.6
1,500 to 1,900	-0.2	-0.2	...	0.2	0.1	-0.3
1,900 to 2,300	1.4	1.9	...	0.9	0.1	1.8
2,300 to 2,700	-0.1	0.0	...	0.1	0.0	-0.1
2,700 and over	0.0	-0.1	...	0.0	-0.2	0.1

... not applicable

Notes: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table 13 Percentage distribution of workers aged 25 to 54 across categories of annual work hours after accounting for union status, industrial structure, job conditions and demographic characteristics, 2004

Categories of annual work hours	Atlantic	Quebec	Ontario	Manitoba–Saskatchewan	Alberta	British Columbia
	Percentage distribution (f_5)					
Fewer than 1,100	15.9	12.4	12.6	13.0	13.1	14.3
1,100 to 1,500	7.2	6.9	5.7	5.6	6.7	7.9
1,500 to 1,900	14.7	27.1	15.7	14.5	14.0	17.3
1,900 to 2,300	51.0	47.9	57.8	54.5	55.3	49.9
2,300 to 2,700	6.8	3.7	4.9	6.7	5.2	4.6
2,700 and over	4.5	2.1	3.2	5.7	5.7	6.0
	Percentage difference from Ontario, accounting for union status, industrial structure, job conditions and demographic characteristics					
Fewer than 1,100	3.3	-0.2	...	0.4	0.5	1.7
1,100 to 1,500	1.5	1.2	...	-0.1	1.0	2.2
1,500 to 1,900	-1.0	11.4	...	-1.2	-1.7	1.6
1,900 to 2,300	-6.8	-9.9	...	-3.3	-2.5	-7.9
2,300 to 2,700	1.9	-1.2	...	1.8	0.3	-0.3
2,700 and over	1.3	-1.1	...	2.5	2.5	2.8
	Percentage contribution of demographic characteristics (f_5-f_4)					
Fewer than 1,100	-0.2	0.0	...	-0.2	0.4	0.1
1,100 to 1,500	-0.2	0.1	...	-0.1	-0.3	-0.2
1,500 to 1,900	-0.3	-0.1	...	0.2	-0.1	0.6
1,900 to 2,300	0.4	0.2	...	0.0	0.0	-0.6
2,300 to 2,700	0.3	0.0	...	0.0	0.0	0.0
2,700 and over	0.2	0.0	...	0.1	-0.1	0.1

... not applicable

Notes: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Appendix A. Description of the DFL decomposition[10]

In Section 5 of this paper, our objective is to estimate what would be the distribution of work hours if a region had the same observational characteristics as another region of reference (i.e. Ontario). This can be done by decomposing the differences in work hours into parts attributable to differences in observable factors between the two regions. We begin by defining individual observations as a vector (Y,Z,r), consisting of work hours Y, a vector of observable characteristics Z, and a region r. Hence, the density of work hours in a particular region can be defined as

$$f_r(Y) \equiv f(Y; r_Y = r, r_Z = r) \qquad \text{(A-1)}$$

The estimation of counterfactual densities always involves two regions: Ontario (which we denote as '*ON*') and the region of interest (which we denote as '*OR*'). For instance, the expression $f_r(Y) \equiv f(Y; r_Y = OR, r_Z = OR)$ represents the observed distribution of work hours in the region of interest, whereas the expression $f_r(Y) \equiv f(Y; r_Y = OR, r_Z = ON)$ represents the observed distribution of work hours that would have prevailed in the region of interest if the characteristics of this region were similar to Ontario.

Our vector of characteristics Z has four components, which we consider in the following primary sequence: union status U, industrial structure S, general employment conditions L and demographic characteristics X. Job conditions include firm size dummies and dummies accounting for the level of management responsibilities. Demographic characteristics include a gender dummy, family situation dummies, education level dummies, work experience and work experience squared. We examine the contribution of each of the four factors (or groups of factors) separately in explaining differences in the distribution of work hours.

Following DFL, we apply the multiplicative properties of conditional distributions to Equation (A-1), so that the density of hours in the region of interest *OR* can be expressed as:

$$f_{OR}(Y) \equiv f(Y; r_Y = OR, r_{U|S,L,X} = OR, r_{S|L,X} = OR, r_{L|X} = OR, r_X = OR) \qquad \text{(A-2)}$$

For each component, the estimation of counterfactual densities relies on the estimation and application of a 'reweighting' function, applied on a sequential basis. For instance, consider union status in Ontario and Quebec. In order to impose the Ontario distribution of union membership on the Quebec distribution of working hours, it is necessary to downweight union members by a factor equal to the percentage difference in the share of unionized workers between Ontario and Quebec (and upweight individuals that do not carry union cards in Quebec) because the share of unionized workers is much larger in Quebec. In terms of notation, this translates into the following expression:

$$f_{OR}(Y) \equiv f(Y; r_Y = OR, r_{U|S,L,X} = ON, r_{S|L,X} = OR, r_{L|X} = OR, r_X = OR) \qquad \text{(A-3)}$$

In our example, this simply represents the density of working hours that would prevail in Quebec if the probability of being unionized in Quebec (conditional on the industrial structure, job

10. This discussion closely parallels that of Daly and Valetta (2004).

conditions and demographic characteristics) was similar to the same Ontario probability, but with hours otherwise determined by the same distributional characteristics prevailing in Quebec.

More formally, the distribution of Equation (A-3) can be expressed as

$$\begin{aligned} f_{OR}(Y) &\equiv f(Y; r_Y = OR, r_{U|S,L,X} = ON, r_{S|L,X} = OR, r_{L|X} = OR, r_X = OR) \\ &= \int\int\int\int_{dF(S \mid L,X,r_{S|L,X}=OR)\cdot dF(L \mid X,r_{L|X}=OR)\cdot dF(X \mid r_X = OR)}^{f(Y \mid U,S,L,X,r_Y = OR)\cdot dF(U \mid S,L,X,r_{U|S,L,X}=ON)\cdot} \\ &= \int\int\int\int_{dF(S \mid L,X,r_{S|L,X}=OR)\cdot dF(L \mid X,r_{L|X}=OR)\cdot dF(X \mid r_X = OR)}^{f(Y \mid U,S,L,X,r_Y = OR)\cdot \Psi_{U|S,L,X}\cdot dF(U \mid S,L,X,r_{U|S,L,X}=OR)\cdot} \end{aligned} \tag{A-4}$$

The term $\Psi_{U|S,L,X}$ is the 'reweighting function,' which can be estimated as follows:

$$\begin{aligned} &\Psi_{U|S,L,X} \\ &\equiv \frac{dF(U \mid S,L,X,r_{U|S,L,X}=ON)}{dF(U \mid S,L,X,r_{U|S,L,X}=OR)} \\ &= U\cdot\left(\frac{\Pr(U=1 \mid S,L,X,r_{U|S,L,X}=ON}{\Pr(U=1 \mid S,L,X,r_{U|S,L,X}=OR}\right)+(1-U)\cdot\left(\frac{\Pr(U=0 \mid S,L,X,r_{U|S,L,X}=ON}{\Pr(U=0 \mid S,L,X,r_{U|S,L,X}=OR}\right) \end{aligned} \tag{A-5}$$

where the union status U only takes the value 0 or 1. The weight $\Psi_{U|S,L,X}$ simply reflects the difference in the probability of being unionized between Ontario and Quebec among individuals with characteristics (S,L,X). In practice, the conditional probabilities in Equation (A-5) can be estimated by using standard models such as a probit or logit, and then using fitted values.

Section 2 has shown that hours may vary across regions because of compositional differences in the industrial structure. These differences can be accounted for by applying the Ontario distribution of industrial categories on the region of interest:

$$\begin{aligned} f_{OR}(Y) &\equiv f(Y; r_Y = OR, r_{U|S,L,X} = ON, r_{S|L,X} = ON, r_{L|X} = OR, r_X = OR) \\ &= \int\int\int\int_{dF(S \mid L,X,r_{S|L,X}=ON)\cdot dF(L \mid X,r_{L|X}=OR)\cdot dF(X \mid r_X = OR)}^{f(Y \mid U,S,L,X,r_Y = OR)\cdot dF(U \mid S,L,X,r_{U|S,L,X}=ON)\cdot} \\ &= \int\int\int\int_{dF(S \mid L,X,r_{S|L,X}=OR)\cdot dF(L \mid X,r_{L|X}=OR)\cdot dF(X \mid r_X = OR)}^{f(Y \mid U,S,L,X,r_Y = OR)\cdot \Psi_{U|S,L,X}\cdot dF(U \mid S,L,X,r_{U|S,L,X}=OR)\cdot \Psi_{S|L,X}\cdot} \end{aligned} \tag{A-6}$$

Where $\Psi_{S|L,X}$ can be defined as follows:

$$\Psi_{S|L,X} \equiv \frac{dF(S \mid L,X,r_{S|L,X}=ON)}{dF(S \mid L,X,r_{S|L,X}=OR)} = \sum_{k=1}^{n} I_k \cdot \left(\frac{\Pr(S=k \mid L,X,r_{U|S,L,X}=ON}{\Pr(S=k \mid L,X,r_{U|S,L,X}=OR}\right) \tag{A-7}$$

where I_k=1 if S=k and I_k=0 otherwise. With k possible outcomes (corresponding to a specific number of industrial categories), these probabilities can be estimated by using a multinomial logit model, which has the appropriate properties to deal with unordered polychotomous dependent variables.[11]

Section 2 has also shown that job conditions may also influence the distribution of working time. This includes a variety of factors, which we regroup under the term L. We account for these conditions by including another reweighting function in the density of hours:

$$\begin{aligned} f_{OR}(Y) &\equiv f(Y; r_Y = OR, r_{U|S,L,X} = ON, r_{S|L,X} = ON, r_{L|X} = ON, r_X = OR) \\ &= \int\int\int\int\int f(Y \mid U,S,L,X, r_Y = OR) \cdot dF(U \mid S,L,X, r_{U|S,L,X} = ON) \cdot \\ &\quad dF(S \mid L,X, r_{S|L,X} = ON) \cdot dF(L \mid X, r_{L|X} = ON) \cdot dF(X \mid r_X = OR) \\ &= \int\int\int\int\int f(Y \mid U,S,L,X, r_Y = OR) \cdot \Psi_{U|S,L,X} \cdot dF(U \mid S,L,X, r_{U|S,L,X} = OR) \cdot \Psi_{S|L,X} \cdot \\ &\quad dF(S \mid L,X, r_{S|L,X} = OR) \cdot \Psi_{L|X} \cdot dF(L \mid X, r_{L|X} = OR) \cdot dF(X \mid r_X = OR) \end{aligned} \tag{A-8}$$

Using Bayesian rule, the reweighting function $\Psi_{L|X}$ can be estimated as follows:

$$\begin{aligned} &\Psi_{L|X} \\ &\equiv \frac{dF(L \mid X, r_{L|X} = ON)}{dF(L \mid X, r_{L|X} = OR)} \\ &= \frac{\Pr(r_L = ON \mid L, X)}{\Pr(r_L = OR \mid L, X)} \cdot \frac{\Pr(r_L = OR \mid X)}{\Pr(r_L = ON \mid X)} \end{aligned} \tag{A-9}$$

Again, these relative probabilities of being in either sample can be estimated with logit models. Finally, we account for demographic characteristics by computing another reweighting function Ψ_X, which can be obtained as follows (again using Bayesian rule):

$$\begin{aligned} &\Psi_X \\ &\equiv \frac{dF(X, r_X = ON)}{dF(X, r_X = OR)} \\ &= \frac{\Pr(r_X = ON \mid X)}{\Pr(r_X = OR \mid X)} \cdot \frac{\Pr(r_X = OR)}{\Pr(r_X = ON)} \end{aligned} \tag{A-10}$$

This final weighting function corresponds to the relative probability of observing a worker with characteristics X in the Ontario sample (versus the other region of interest)—normalized by the unconditional probability of being in either sample.

11. We use the following industrial categories for the decompositions related to the distributions of annual work hours: agriculture; oil and gas; construction and utilities; manufacturing; consumer services; business services; education services; health care services; wholesale and transportation; arts, entertainment and recreation (includes information and culture); all other services; and public administration.

The following table summarizes the sequence of our primary-order decomposition:

Distribution	Weight
1. Region of interest, distribution of work hours $f_1(Y) \equiv f(Y; r_Y = OR, r_{U\backslash S,L,X} = OR, r_{S\backslash L,X} = OR, r_{L\backslash X} = OR, r_X = OR)$	θ_{OR}
2. (1) with Ontario's union status $f_2(Y) \equiv f(Y; r_Y = OR, r_{U\backslash S,L,X} = ON, r_{S\backslash L,X} = OR, r_{L\backslash X} = OR, r_X = OR)$	$\theta_{OR} \cdot \Psi_{U\backslash S,L,X}$
3. (2) with Ontario's distribution of industries $f_3(Y) \equiv f(Y; r_Y = OR, r_{U\backslash S,L,X} = ON, r_{S\backslash L,X} = ON, r_{L\backslash X} = OR, r_X = OR)$	$\theta_{OR} \cdot \Psi_{U\backslash S,L,X} \cdot \Psi_{S\backslash L,X}$
4. (3) with Ontario's general employment conditions $f_4(Y) \equiv f(Y; r_Y = OR, r_{U\backslash S,L,X} = ON, r_{S\backslash L,X} = ON, r_{L\backslash X} = ON, r_X = OR)$	$\theta_{OR} \cdot \Psi_{U\backslash S,L,X} \cdot \Psi_{S\backslash L,X} \cdot \Psi_{L\backslash X}$
5. (4) with Ontario's demographic characteristics $f_5(Y) \equiv f(Y; r_Y = OR, r_{U\backslash S,L,X} = ON, r_{S\backslash L,X} = ON, r_{L\backslash X} = ON, r_X = ON)$	$\theta_{OR} \cdot \Psi_{U\backslash S,L,X} \cdot \Psi_{S\backslash L,X} \cdot \Psi_{L\backslash X} \cdot \Psi_X$
6. Ontario distribution of work hours $f_6(Y) \equiv f(Y; r_Y = ON, r_{U\backslash S,L,X} = ON, r_{S\backslash L,X} = ON, r_{L\backslash X} = ON, r_X = ON)$	θ_{ON}

Hence, the relative contribution of the union status to the total difference in work hours densities corresponds to $(f_2\text{-}f_1)$; the contribution attributable to compositional differences in the industrial structure is equal to $(f_3\text{-}f_2)$; the contribution of differences in job conditions is $(f_4\text{-}f_3)$; the contribution related to demographic characteristics is $(f_5\text{-}f_4)$; and the contribution of all other factors (unobservables) is simply $(f_6\text{-}f_5)$. Owing to concerns that the estimated effects of each factor may be affected by the order of the decomposition, we also generated alternative results from the reverse-order decomposition—but this did not significantly alter the conclusions of this report (the exact procedure used to generate reverse-order weights and complete results from the reverse order decomposition are shown in Appendix B).

Appendix B. Description of the reverse decomposition

This section explains the method used for the reverse DFL decomposition. We begin by defining the density of hours in the region of interest *OR* as

$$f_{OR}(Y) \equiv f(Y; r_Y = OR, r_{X|L,S,U} = OR, r_{L|S,U} = OR, r_{S|U} = OR, r_U = OR) \tag{B-1}$$

The density of working hours that would prevail in the region of interest if the demographic characteristics were observationally similar to those in Ontario can be expressed as follows:

$$\begin{aligned} f_{OR}(Y) &\equiv f(Y; r_Y = OR, r_{X|L,S,U} = ON, r_{L|S,U} = OR, r_{S|U} = OR, r_U = OR) \\ &= \int\int\int\int \frac{f(Y \mid X, L, S, U, r_Y = OR) \cdot dF(X \mid L, S, U, r_{X|L,S,U} = ON) \cdot}{dF(L \mid S, U, r_{L|S,U} = OR) \cdot dF(S \mid U, r_{S|U} = OR) \cdot dF(U \mid r_U = OR)} \\ &= \int\int\int\int \frac{f(Y \mid X, L, S, U, r_Y = OR) \cdot \Psi_{X|L,S,U} \cdot dF(X \mid L, S, U, r_{X|L,S,U} = OR) \cdot}{dF(L \mid S, U, r_{L|S,U} = OR) \cdot dF(S \mid U, r_{S|U} = OR) \cdot dF(U \mid r_U = OR)} \end{aligned} \tag{B-2}$$

This process can be repeated on a sequential basis for each of the components. In the end, the density of work hours that would prevail in the region of interest if demographic characteristics, industrial structure, job conditions and union status were similar to those in Ontario will be

$$\begin{aligned} f_{OR}(Y) &\equiv f(Y; r_Y = OR, r_{X|L,S,U} = ON, r_{L|S,U} = OR, r_{S|U} = OR, r_U = OR) \\ &= \int\int\int\int \frac{f(Y \mid X, L, S, U, r_Y = OR) \cdot dF(X \mid L, S, U, r_{X|L,S,U} = ON) \cdot}{dF(L \mid S, U, r_{L|S,U} = OR) \cdot dF(S \mid U, r_{S|U} = OR) \cdot dF(U \mid r_U = OR)} \\ &= \int\int\int\int \frac{f(Y \mid X, L, S, U, r_Y = OR) \cdot \Psi_{X|L,S,U} \cdot dF(X \mid L, S, U, r_{X|L,S,U} = OR) \cdot \Psi_{L|S,U} \cdot}{dF(L \mid S, U, r_{L|S,U} = OR) \cdot \Psi_{S|U} \cdot dF(S \mid U, r_{S|U} = OR) \cdot \Psi_U \cdot dF(U \mid r_U = OR)} \end{aligned} \tag{B-3}$$

The reweighting function Ψ_U is estimated as follows:

$$\begin{aligned} &\Psi_U \\ &\equiv \frac{dF(U \mid r_U = ON)}{dF(U \mid r_U = OR)} \\ &= U \cdot \left(\frac{\Pr(U = 1 \mid r_U = ON}{\Pr(U = 1 \mid r_U = OR} \right) + (1 - U) \cdot \left(\frac{\Pr(U = 0 \mid r_U = ON}{\Pr(U = 0 \mid r_U = OR} \right) \end{aligned} \tag{B-4}$$

where the union status U only takes the value 0 or 1. This reweighting function simply reflects the difference in the unconditional probabilities of being unionized between Ontario and the region of interest.

The reweighting function $\Psi_{S|U}$ is defined as follows:

$$\begin{aligned} &\Psi_{S|U} \\ &\equiv \frac{dF(S \mid U, r_{S|U} = ON)}{dF(S \mid U, r_{S|U} = OR)} = \sum_{k=1}^{n} I_k \cdot \left(\frac{\Pr(S = k \mid U, r_{S|U} = ON}{\Pr(S = k \mid U, r_{S|U} = OR} \right) \end{aligned} \tag{B-5}$$

where $I_k=1$ if $S=k$ and $I_k=0$ otherwise. There are k possible outcomes, corresponding to a specific number of industrial categories. In practice these probabilities can be estimated through simple cross-tabulation of the industrial structure and union status outcomes. In other words, we calculate the percentage of observations that fall in to each of the 12 categories defined by the industrial structure and two possible values (0 and 1) for the union status variable. Observations falling into a particular cell for the reference region are upweighted or downweighted by the proportional difference in the percentage share of that cell between Ontario and the region of interest.

Using Bayesian rule, we define the reweighting function $\Psi_{L|S,U}$ in Equation (B-6), in which the relative probability of being in either sample can be estimated with logit models:

$$\begin{aligned}&\Psi_{L|S,U}\\ &\equiv \frac{dF(L\mid S,U,r_{L|S,U}=ON)}{dF(L\mid S,U,r_{L|S,U}=OR)}\\ &= \frac{\Pr(r_L=ON\mid L,S,U)}{\Pr(r_L=OR\mid L,S,U)}\cdot\frac{\Pr(r_L=OR\mid S,U)}{\Pr(r_L=ON\mid S,U)}\end{aligned} \qquad \text{(B-6)}$$

Finally, the last reweighting function $\Psi_{X|L,S,U}$ can be obtained as follows:

Since

$$\Psi_{X|L,S,U}\cdot\Psi_{L|S,U}\cdot\Psi_{S|U}\cdot\Psi_{U}=\Psi_{U|S,L,X}\cdot\Psi_{S|L,X}\cdot\Psi_{L|X}\cdot\Psi_{X}$$

This can be rearranged to estimate our reweighting function as follows: (B-7)

$$\Psi_{X|L,S,U}=\frac{\Psi_{U|S,L,X}\cdot\Psi_{S|L,X}\cdot\Psi_{L|X}\cdot\Psi_{X}}{\Psi_{L|S,U}\cdot\Psi_{S|U}\cdot\Psi_{U}}$$

One implication of this equality is equivalence of the net effect of the four conditioning factors in the primary-order and reverse-order cases.

For the most part, results from the reverse decomposition (shown in the next pages) confirm the larger role played by differences in the industrial structure in explaining differences in work hours, and also confirm that differences in union status and in demographic characteristics are largely ineffectual in explaining those differences. Hence, results from the reverse order decomposition do not fundamentally differ from primary order results.

Table B.1 Percentage distribution of workers aged 25 to 54 across categories of annual work hours after accounting for demographic characteristics, 2004

Categories of annual work hours	Atlantic	Quebec	Ontario	Manitoba-Saskatchewan	Alberta	British Columbia
	Percentage distribution					
Fewer than 1,100	17.5	12.6	12.6	13.2	12.9	15.9
1,100 to 1,500	8.2	8.2	5.7	6.8	7.3	8.8
1,500 to 1,900	15.7	29.5	15.7	15.8	15.6	17.8
1,900 to 2,300	47.6	44.0	57.8	52.5	51.4	47.4
2,300 to 2,700	6.4	3.5	4.9	6.3	6.0	4.6
2,700 and over	4.6	2.2	3.2	5.4	6.9	5.5
	Percentage difference from Ontario, accounting for demographic characteristics					
Fewer than 1,100	4.9	0.0	...	0.6	0.3	3.3
1,100 to 1,500	2.5	2.5	...	1.1	1.6	3.1
1,500 to 1,900	0.0	13.8	...	0.1	-0.1	2.1
1,900 to 2,300	-10.2	-13.8	...	-5.3	-6.4	-10.4
2,300 to 2,700	1.5	-1.4	...	1.4	1.1	-0.3
2,700 and over	1.4	-1.0	...	2.2	3.7	2.3
	Percentage contribution of demographic characteristics					
Fewer than 1,100	0.4	-0.6	...	-0.7	0.1	0.3
1,100 to 1,500	-0.2	0.0	...	-0.3	-0.2	0.3
1,500 to 1,900	-0.7	1.6	...	0.4	0.6	0.5
1,900 to 2,300	1.0	-0.9	...	0.7	-0.4	-1.2
2,300 to 2,700	-0.2	-0.1	...	-0.1	-0.5	-0.3
2,700 and over	-0.3	-0.1	...	0.0	0.5	0.3

... not applicable

Notes: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table B.2 Percentage distribution of workers aged 25 to 54 across categories of annual work hours after accounting for demographic characteristics and job conditions, 2004

Categories of annual work hours	Atlantic	Quebec	Ontario	Manitoba–Saskatchewan	Alberta	British Columbia
	Percentage distribution					
Fewer than 1,100	16.7	11.7	12.6	12.7	13.1	15.1
1,100 to 1,500	7.8	7.6	5.7	6.5	7.3	8.4
1,500 to 1,900	15.4	29.4	15.7	16.1	15.7	17.3
1,900 to 2,300	48.8	45.7	57.8	52.8	51.0	48.9
2,300 to 2,700	6.5	3.5	4.9	6.4	6.0	4.6
2,700 and over	4.7	2.1	3.2	5.4	6.8	5.7
	Percentage difference from Ontario, accounting for demographic characteristics and job conditions					
Fewer than 1,100	4.1	-0.9	...	0.1	0.5	2.5
1,100 to 1,500	2.1	1.9	...	0.8	1.6	2.7
1,500 to 1,900	-0.3	13.7	...	0.4	0.0	1.6
1,900 to 2,300	-9.0	-12.1	...	-5.0	-6.8	-8.9
2,300 to 2,700	1.6	-1.4	...	1.5	1.1	-0.3
2,700 and over	1.5	-1.1	...	2.2	3.6	2.5
	Percentage contribution of job conditions					
Fewer than 1,100	-0.8	-0.9	...	-0.5	0.2	-0.8
1,100 to 1,500	-0.4	-0.6	...	-0.3	0.0	-0.4
1,500 to 1,900	-0.3	-0.1	...	0.3	0.1	-0.5
1,900 to 2,300	1.2	1.7	...	0.3	-0.4	1.5
2,300 to 2,700	0.1	0.0	...	0.1	0.0	0.0
2,700 and over	0.1	-0.1	...	0.0	-0.1	0.2

... not applicable

Notes: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table B.3 Percentage distribution of workers aged 25 to 54 across categories of annual work hours after accounting for demographic characteristics, job conditions and industrial structure, 2004

Categories of annual work hours	Atlantic	Quebec	Ontario	Manitoba–Saskatchewan	Alberta	British Columbia
	Percentage distribution					
Fewer than 1,100	15.7	11.9	12.6	12.4	13.1	14.2
1,100 to 1,500	7.2	7.0	5.7	5.7	6.7	7.9
1,500 to 1,900	14.8	28.1	15.7	15.1	14.0	17.6
1,900 to 2,300	51.2	47.4	57.8	54.9	55.3	49.7
2,300 to 2,700	6.7	3.5	4.9	6.4	5.2	4.6
2,700 and over	4.4	2.1	3.2	5.4	5.7	6.0
	Percentage difference from Ontario, accounting for demographic characteristics, job conditions and industrial structure					
Fewer than 1,100	3.1	-0.7	...	-0.2	0.5	1.6
1,100 to 1,500	1.5	1.3	...	0.0	1.0	2.2
1,500 to 1,900	-0.9	12.4	...	-0.6	-1.7	1.9
1,900 to 2,300	-6.6	-10.4	...	-2.9	-2.5	-8.1
2,300 to 2,700	1.8	-1.4	...	1.5	0.3	-0.3
2,700 and over	1.2	-1.1	...	2.2	2.5	2.8
	Percentage contribution of industrial structure					
Fewer than 1,100	-1.0	0.2	...	-0.3	0.0	-0.9
1,100 to 1,500	-0.6	-0.6	...	-0.8	-0.6	-0.5
1,500 to 1,900	-0.6	-1.3	...	-1.0	-1.7	0.3
1,900 to 2,300	2.4	1.7	...	2.1	4.3	0.8
2,300 to 2,700	0.2	0.0	...	0.0	-0.8	0.0
2,700 and over	-0.3	0.0	...	0.0	-1.1	0.3

... not applicable

Notes: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

Table B.4 Percentage distribution of workers aged 25 to 54 across categories of annual work hours after accounting for demographic factors, job conditions, industrial structure and union status, 2004

Categories of annual work hours	Atlantic	Quebec	Ontario	Manitoba–Saskatchewan	Alberta	British Columbia
	Percentage distribution					
Fewer than 1,100	15.9	12.4	12.6	13.0	13.1	14.3
1,100 to 1,500	7.2	6.9	5.7	5.6	6.7	7.9
1,500 to 1,900	14.7	27.1	15.7	14.5	14.0	17.3
1,900 to 2,300	51.0	47.9	57.8	54.5	55.3	49.9
2,300 to 2,700	6.8	3.7	4.9	6.7	5.2	4.6
2,700 and over	4.5	2.1	3.2	5.7	5.7	6.0
	Percentage difference from Ontario, accounting for demographic characteristics, job conditions, industrial structure and union status					
Fewer than 1,100	3.3	-0.2	...	0.4	0.5	1.7
1,100 to 1,500	1.5	1.2	...	-0.1	1.0	2.2
1,500 to 1,900	-1.0	11.4	...	-1.2	-1.7	1.6
1,900 to 2,300	-6.8	-9.9	...	-3.3	-2.5	-7.9
2,300 to 2,700	1.9	-1.2		1.8	0.3	-0.3
2,700 and over	1.3	-1.1	...	2.5	2.5	2.8
	Percentage contribution of union status					
Fewer than 1,100	0.2	0.5	...	0.6	0.0	0.1
1,100 to 1,500	0.0	-0.1	...	-0.1	0.0	0.0
1,500 to 1,900	-0.1	-1.0	...	-0.6	0.0	-0.3
1,900 to 2,300	-0.2	0.5	...	-0.4	0.0	0.2
2,300 to 2,700	0.1	0.2	...	0.3	0.0	0.0
2,700 and over	0.1	0.0	...	0.3	0.0	0.0

... not applicable

Notes: Missing observations for union status, industrial structure, job conditions or demographic characteristics are excluded. Weights for the remaining sample have been adjusted upwards proportionately to compensate.

Source: Statistics Canada, 2004 Survey of Labour and Income Dynamics.

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